YASKAWA
The Drive for Quality™

Sigma FSP Servo System Catalog

Sigma FSP Amplifier – Sigma II Servomotor

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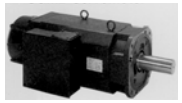
Product Overview

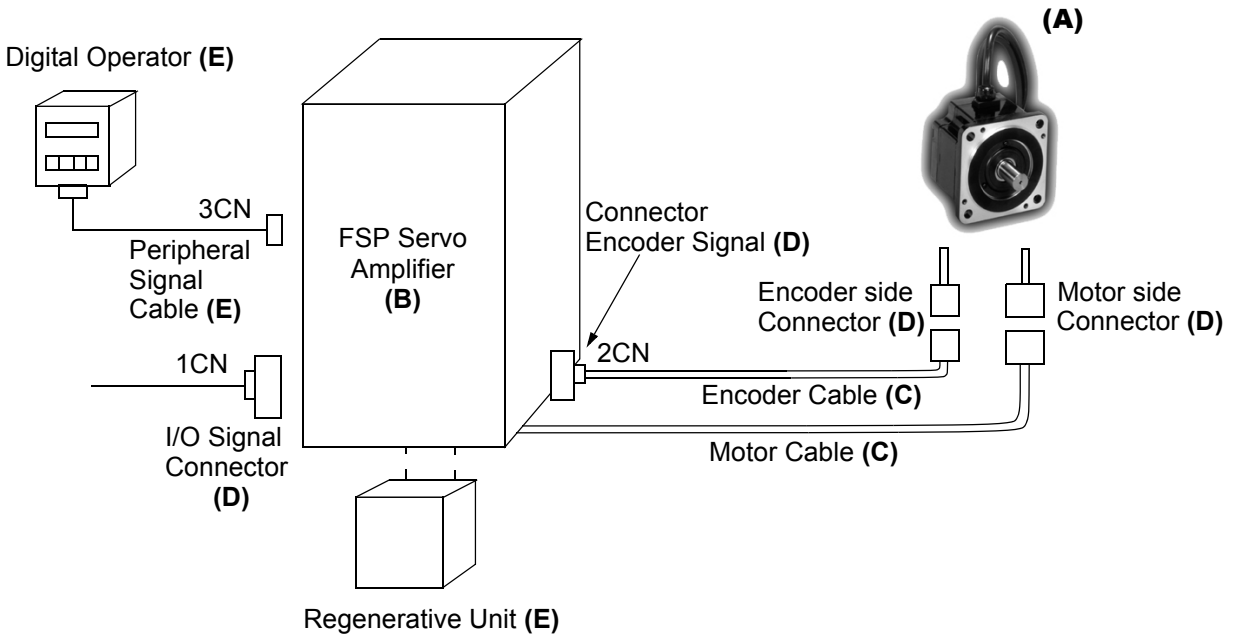
Yaskawa has a full lineup of servomotors and amplifiers. Choose the best drives for your needs and specifications.

Servomotor									
Series		Description	Applications						
Small Capacity	**SGMAH** (3000rpm/5000rpm max) 	High Speed Series Large torque required at low inertia.	Chip Mounters	PCB Drilling Machines	Packaging Machines	Robots	Material Handling Equipment		
	SGMPH (3000rpm/5000rpm max) 	Flat Series Short L-length. Good for installation in compact spaces.							
Medium Capacity	**SGMGH** (1500rpm/3000rpm max) 	General Purpose High speed rotation required without load.						Machine Tool Feeds	
	SGMSH (3000rpm/5000rpm max) 	High Speed Series High torque required at low inertia.	Chip Mounters	PCB Drilling Machines					
	SGMUH (6000rpm max) 	High Speed Series High torque at 6000rpm.							

Servomotor		Servo Amplifier Type FSP-***				Page
Peak Torque	Capacity	110V	230V		480V	
		Single-phase	Single-phase	Three-phase	Three-phase	
SGMAH up to 1,010oz • in	30W	A3BMC	A3AMC	—	—	5, 89
	50W	A5BMC	A5AMC	—	—	
	100W	01BMC	01AMC	—	—	
	200W	02BMC	02AMC	—	—	
	400W	—	04AMC	—	—	
	750W	—	08AMC-S	—	—	
SGMPH up to 2,027oz • in	100W	01BMC	01AMC	—	—	23, 89
	200W	02BMC	02AMC	—	—	
	400W	—	04AMC	—	—	
	750W	—	08AMC-S	—	—	
	1500W	—	15AMC-S	—	—	
SGMGH up to 1,988in • lb	0.45kW	—	08AMC-S	—	05DMC	53, 89, 115, 141
	0.85kW	—	—	10AMC	10DMC	
	1.3kW	—	15AMC-S	—	15DMC	
	1.8kW	—	—	20AMC	20DMC	
	2.9kW	—	—	30AMC	30DMC	
	4.4kW	—	—	—	50DMC	
SGMSH up to 422in • lb	1.0kW	—	—	10AMC	10DMC	77, 89, 127, 141
	1.5kW	—	15AMC-S	—	15DMC	
	2.0kW	—	—	20AMC	20DMC	
	3.0kW	—	—	30AMC	30DMC	
	4.0kW	—	—	—	50DMC	
	5.0kW	—	—	—	50DMC	
SGMUH up to 190in • lb	1.0 kW	—	—	—	10DMC	127, 141
	1.5 kW	—	—	—	15DMC	
	3.0kW	—	—	—	30DMC	

Selecting Your Sigma Servo System

For your convenience, each motor series in this selection guide includes a diagram to help you select and identify the components necessary for your system. Each item is letter-coded and cross-referenced in the option tables on the following pages.



1. First, select the ***Sigma servomotor*** suited for your application using the Yaskawa Servomotor Sizing Software available at www.yaskawa.com. Using the tab indicators in this catalog, locate the section describing the type of servomotor you selected.
2. Then select a compatible ***amplifier*** using the FSP Servo Amplifier Selection Table in the appropriate servomotor section of this catalog.
3. Yaskawa offers ***pre-wired power and encoder cables*** with correctly matched, high quality connectors attached to permit correct interconnection. Refer to the Pre-wired Cable Selection Table to select the correct cable assembly from the list of standard cable lengths.
4. Solder-type ***connectors*** without cables are also available. Refer to the appropriate Servomotor Connector Selection Table to select the connector kit to be used with the selected servomotor or encoder (with or without brake).
5. Refer to the Peripheral Device Selection Table to select ***peripheral equipment*** to be used with the servo amplifier (i.e., digital operator, regenerative unit, software, etc.).
6. Specify technical product manual (YEA-SIA-FSP-3) on your FSP Servo System purchase order. One manual is available at no charge with each purchase order. The manual can also be downloaded at no charge from Yaskawa's Web site at www.yaskawa.com.

Each table includes a column labeled "Item Class," which classifies the availability of the specified option. Following are descriptions of the codes used:

Stock:	Normally 3 to 5 days lead time for most order quantities. 3 to 5 weeks maximum if temporary outages occur. For critical lead times or requirements for larger quantity shipments, check with your Yaskawa inside sales representative.
Limited Stock:	Typically, small quantities are available from stock. These items will likely change to stock items as the order demand increases. For critical lead times or requirements for larger quantity shipments, check with your Yaskawa inside sales representative.
Non-Stock:	Normal delivery: 12 to 16 weeks.

Super High Power Rate Series

SGMAH Servomotors - With Incremental / Absolute Encoder

Rated Output: 30W, 50W, 100W, 200W, 400W, 750W

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Design Features

1. **Compact**
   - Small sized motor
     Five frame sizes (including NEMA 23 and 34 flanges): up to 1,010oz • in peak torque
     Smaller installation space for more compact machine designs.
2. **High Speed**
   - High power rating
     High power is achieved by minimizing the inertia of the motor
     This increases the acceleration/deceleration rate and reduces positioning time
   - Maximum rotation speed of 5000rpm
     Increases maximum rotation speed and shortens positioning time
   - Rated speed of 3,000rpm
3. **Encoders (reduced wiring serial encoder)**
   - 13-bit (2048 ppr x 4) incremental encoder (standard)
   - 16-bit (16384) absolute encoder (option)
4. **Enclosure**
   - Totally enclosed, self-cooled IP55 (not including shaft)
   - Optional shaft seals are available.
5. **Application Emphasis**
   - Compact, high torque to inertia ratio
   - Chip mounters
   - PCB drilling machines
   - Robots
   - Conveyors
   - Packaging
6. **Low Noise**
   - Adopting the IGBT power element eliminates irritating “metallic” sounds
7. **Certified International Standards**
   - UL, cUL recognized (File #: E165827), CE compliance

Servomotor Ratings and Specifications

Time Rating:	Continuous	Enclosure:	Totally-enclosed, self-cooled	Excitation:	Permanent magnet
Insulation:	Class B	Ambient Temperature:	0 to 40ºC	Drive Method:	Direct drive
Vibration:	15µm or less	Ambient Humidity:	20 to 80% (non-condensing)	Mounting:	Flange-mounted
Withstand Voltage:	$1500V_{ac}$	Rated Rotation Speed:	3000rpm	Applicable Encoder:	13-bit incremental or 16-bit absolute encoder
Insulation Resistance:	10MΩ minimum at $500V_{DC}$	Maximum Rotation Speed:	5000rpm		

Specifications are the same for either absolute or incremental encoders.

System Voltage	MOTORS SGMAH-	Rated Output	Rated Torque*		Instantaneous Peak Torque*		Continuous Rated Current	Maximum Peak Current	Rated Angular Acceleration	Rated Power Rate*
		W (hp)	oz • in	N • m	oz • in	N • m	A_{rms}	A_{rms}	rad/s^2	kW/s
$100V_{ac}$	A3B	30 (0.04)	13.5	0.0955	40.5	0.286	0.66	2.0	57500	5.49
	A5B	50 (0.07)	22.5	0.159	67.7	0.477	0.95	2.9	72300	11.5
	01B	100 (0.13)	45.0	0.318	135	0.955	2.4	7.2	87400	27.8
	02B	200 (0.27)	90.2	0.637	270	1.91	3.0	9.0	60100	38.2
$200V_{ac}$	A3A	30 (0.04)	13.5	0.0955	40.5	0.286	0.44	1.3	57500	5.49
	A5A	50 (0.07)	22.5	0.159	67.7	0.477	0.64	2.0	72300	11.5
	01A	100 (0.13)	45.0	0.318	135	0.955	0.91	2.8	87400	27.8
	02A	200 (0.27)	90.2	0.637	270	1.91	2.1	6.5	60100	38.2
	04A	400 (0.53)	180	1.27	541	3.82	2.8	8.5	73600	93.7
	08A	750 (1.01)	338	2.39	1014	7.16	4.4	13.4	35500	84.8

* Values when the servomotor is combined with an FSP servo amplifier.

System Voltage	MOTORS SGMAH-	Moment of Inertia				Holding Brake (at 20°C)				Allowable Load Inertia*
		Motor without Brake		Motor with Brake		Capacity	Torque	Coil Resistance	Rated Current	
		$oz \cdot in \cdot s^2 \times 10^{-3}$	$kg \cdot m^2 \times 10^{-4}$	$oz \cdot in \cdot s^2 \times 10^{-3}$	$kg \cdot m^2 \times 10^{-4}$	W	N • m	Ω	A	$kg \cdot m^2 \times 10^{-4}$
$100V_{ac}$	A3B	0.235	0.0166	0.355	0.251	6	0.0955	96	0.25	0.63
	A5B	0.312	0.0220	0.432	0.0305	6	0.159	96	0.25	0.78
	01B	0.515	0.0364	0.635	0.0449	6	0.318	96	0.25	1.20
	02B	1.50	0.106	2.321	0.164	6.9	0.637	83.5	0.29	3.69
$200V_{ac}$	A3A	0.235	0.0166	0.355	0.0251	6	0.0955	96	0.25	0.63
	A5A	0.312	0.0220	0.432	0.0305	6	0.159	96	0.25	0.78
	01A	0.515	0.0364	0.635	0.0449	6	0.318	96	0.25	1.20
	02A	1.50	0.106	2.321	0.164	6.9	0.637	83.5	0.29	3.69
	04A	2.45	0.173	3.271	0.231	6.9	1.27	83.5	0.29	3.82
	08A	9.52	0.672	11.5	0.811	7.7	2.39	75.2	0.32	13.4

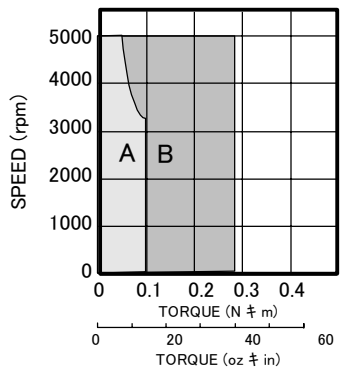
* · Values apply to motors without brake.

· J_L (allowable load inertia) shows the range requiring no exterior regenerative unit. When these values are exceeded, application may be restricted or a regenerative unit may be required.

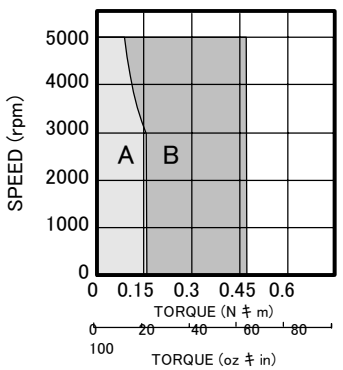
Speed / Torque Curves

200V

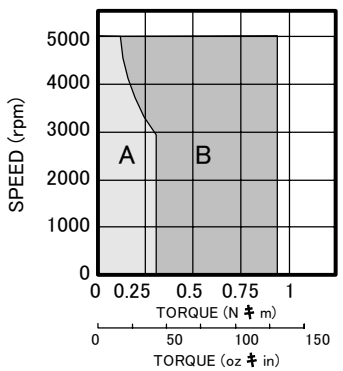
SGMAH-A3A



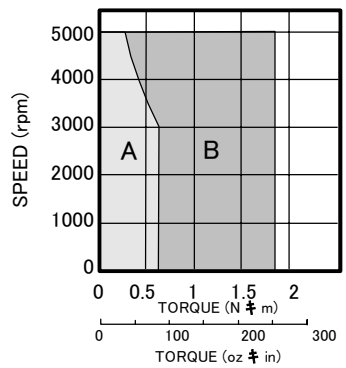
SGMAH-A5A



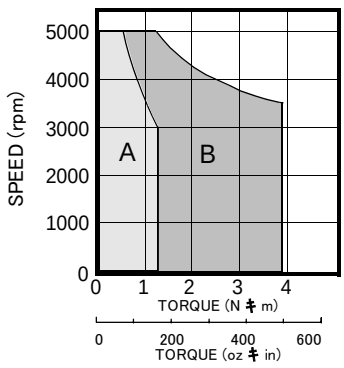
SGMAH-01A



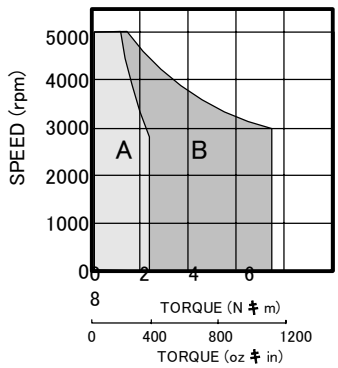
SGMAH-02A



SGMAH-04A

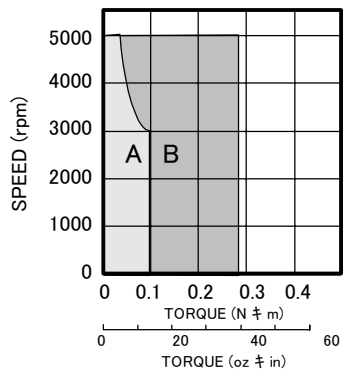


SGMAH08A

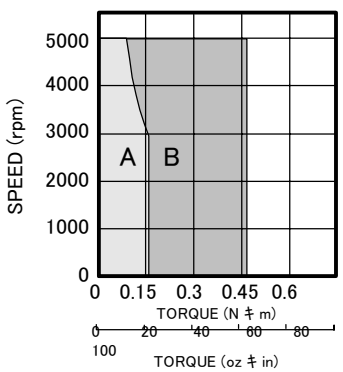


100V

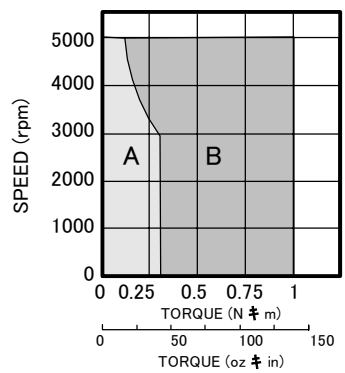
SGMAH-A3B



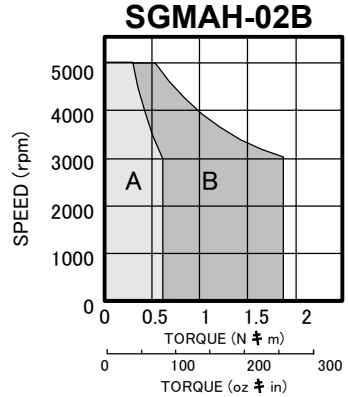
SGMAH-A5B



SGMAH-01B



SGMAH-02B



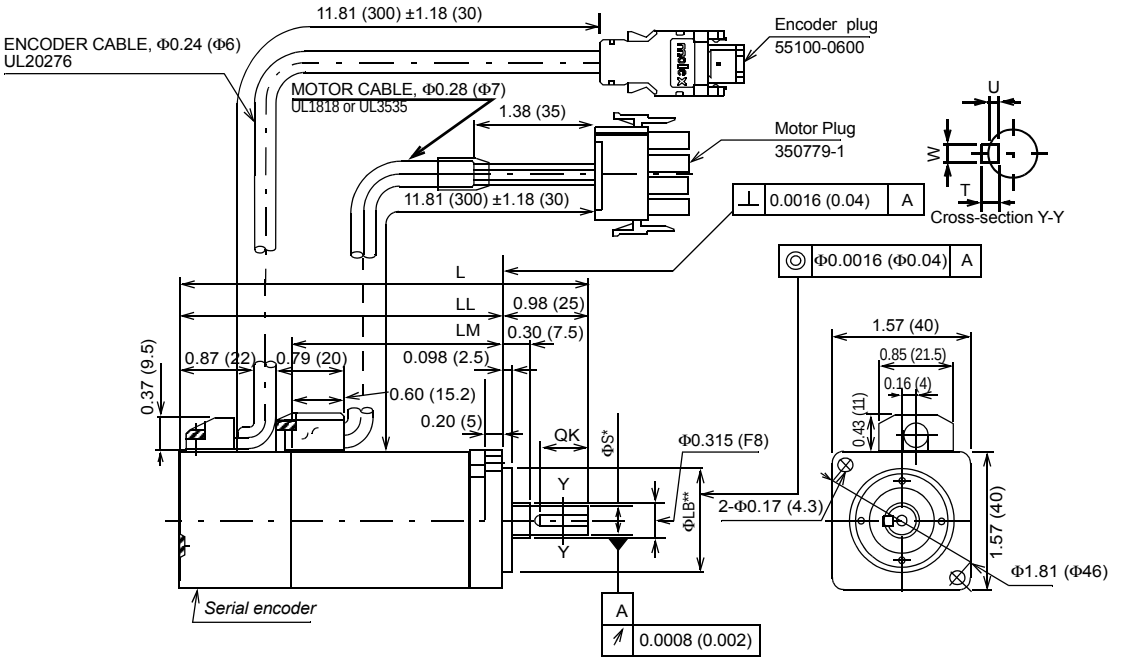
A : CONTINUOUS DUTY ZONE

B : INTERMITTENT DUTY ZONE

Dimensions in inches (mm)

(1) 13-Bit Incremental or 16-Bit Absolute Encoder, without Brake

- **30W (0.04hp), 50W (0.07hp), 100W (0.13hp)**



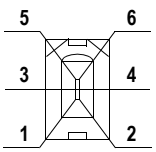
Type SGMAH-†	QK	U	W	T	L	LL	LM	ΦS*	ΦLB**	Output W (hp)	Approximate Mass lb (kg)	Allowable Radial Load lb (N)	Allowable Thrust Load lb (N)
A3☐☐F2☐	Without Keyway				3.72 (94.5)	2.74 (69.5)	1.44 (36.5)	0.24 (6)	1.18 (30)	30 (0.04)	0.66 (0.3)	15 (68)	12 (54)
A3☐☐F4☐	0.55 (14)	0.047 (1.2)	0.079 (2)	0.079 (2)									
A5☐☐F2☐	Without Keyway				4.02 (102)	3.03 (77)	1.73 (44)			50 (0.07)	0.88 (0.4)		
A5☐☐F4☐	0.55 (14)	0.047 (1.2)	0.079 (2)	0.079 (2)									
01☐☐F2☐	Without Keyway				4.7 (119.5)	3.72 (94.5)	2.42 (61.5)	0.31 (8)		100 (0.13)	1.10 (0.5)	17 (78)	
01☐☐F4☐	0.55 (14)	0.07 (1.8)	0.12 (3)	0.12 (3)									

†Some motor dimensions vary for motors with the optional shaft seal: See p.15 for details.

Connector Specifications

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.2362	+0.0000-0.0003	1.181	+0.0000 -0.0008
	0.3150	+0.0000-0.0004		
mm	6.000	+0.000 -0.008	30.000	+0.000 -0.021
	8.000	+0.000 -0.009		

Encoder Plug

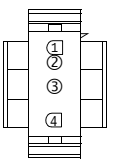


Encoder Connection		
Pin	Output	Wire Color
1	PG 5V	Red
2	PG 0V	Black
3	Battery +	Orange
4	Battery –	White/Orange
5	Data +	Light Blue
6	Data -	White/Light Blue

Note: Pins Number 3 and 4 are connectors used for 16-bit absolute encoder option only.

Plug: 55100-0600 (Molex)
Mating connector:
Socket: 54280-0600

Motor Plug



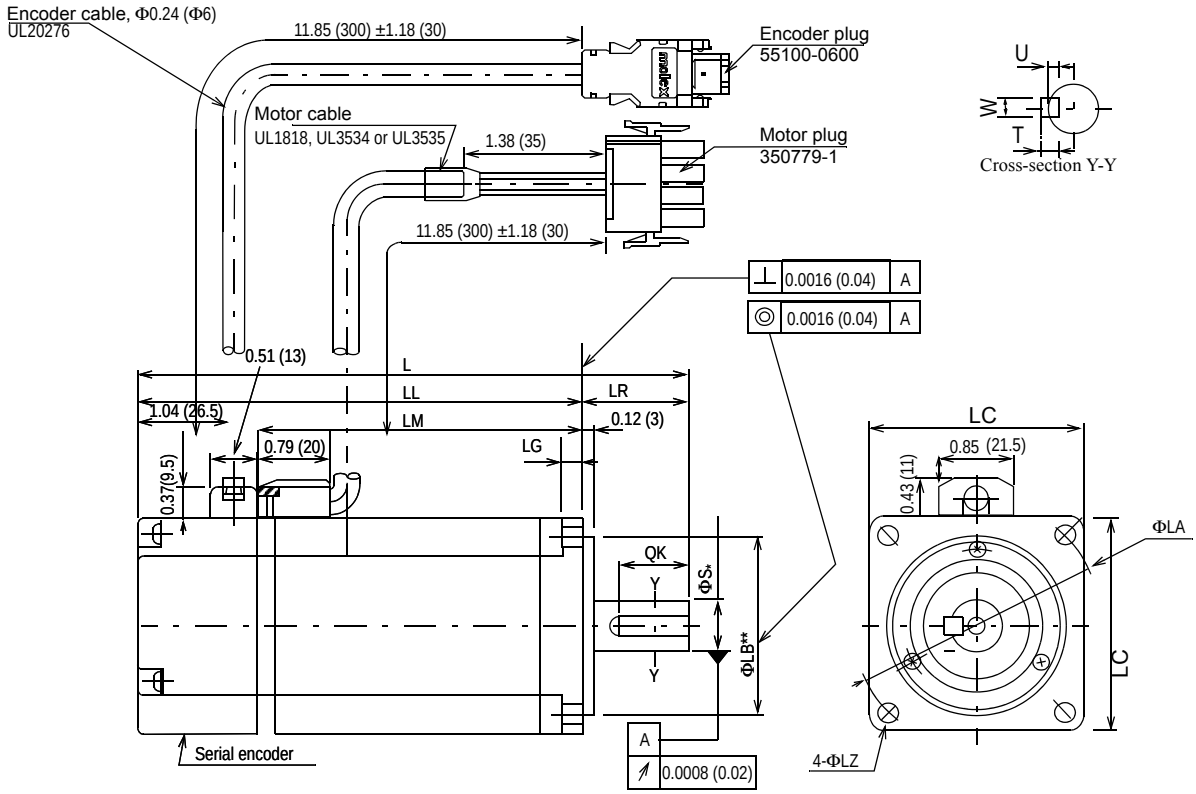
Motor Connection		
Pin	Output	Wire Color
1	Phase U	Red
2	Phase V	White
3	Phase W	Blue
4	FG (Frame Ground)	Green/Yellow

Plug 350779-1 (AMP)
Pin: 350561-3 or 350690-3 (Nos. 1 to 3)
Ground pin: 770210-1 (No 4)

Mating connector:
Cap: 350780-1
Socket: 350570-3 or 350689-3

(1) 13-Bit Incremental or 16-Bit Absolute Encoder, without Brake

- **200W (0.27hp), 400W (0.53hp), 750W (1.01hp)**



Type SGMAH-†	L	LL	LM	LR	LG	LC	ΦLA	ΦLZ	ΦS*	ΦLB**	QK	U	W	T	Output W (hp)	Approximate Mass lb (kg)	Allowable Radial Load lb (N)	Allowable Thrust Load lb (N)
02□□F4□	4.98 (126.5)	3.8 (96.5)	2.46 (62.5)	1.18 (30)	0.24 (6)	2.36 (60)	2.76 (70)	0.22 (5.5)	0.55 (14)	1.97 (50)	0.79 (20)	0.12 (3)	0.2 (5)	0.2 (5)	200 (0.27)	2.43 (1.1)	55 (245)	17 (74)
04A□F4□	6.08 (154.5)	4.9 (124.5)	3.56 (90.5)												400 (0.53)	3.75 (1.7)		
08A□F4□	7.28 (185)	5.71 (145)	4.37 (111)	1.57 (40)	0.31 (8)	3.15 (80)	3.54 (90)	0.28 (7)	0.63 (16)	2.76 (70)	1.18 (30)	0.12 (3)	0.2 (5)	0.2 (5)	750 (1.01)	7.5 (3.4)	88 (392)	33 (147)

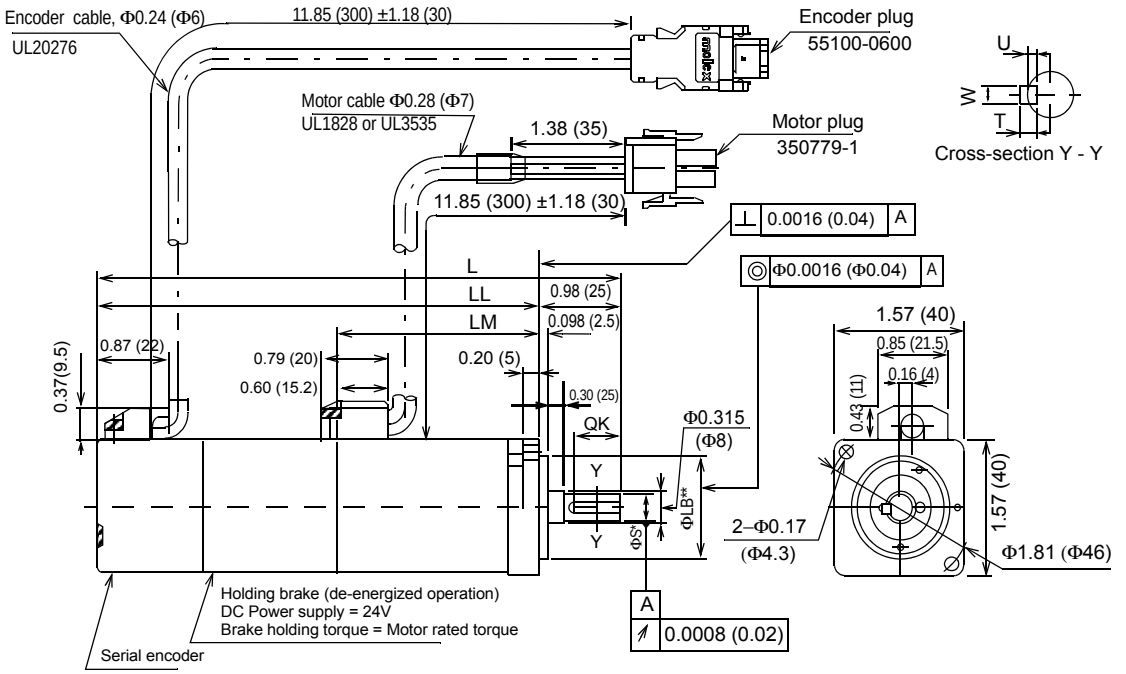
*Please see the following table for dimension tolerances.

†Some motor dimensions vary for motors with the optional shaft seal: See p.16 for details.

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.5512	+0.0000-0.0004	1.9685	+0.0000 -0.0010
	0.6299	+0.0000-0.0004	2.7559	+0.0000 -0.0012
mm	14.000	+0.000 -0.011	50.000	+0.000 -0.025
	16.000	+0.000 -0.011	70.000	+0.000 -0.030

(2) 13-Bit Incremental or 16-Bit Absolute Encoder, with Brake

- **30W (0.04hp), 50W (0.07hp), 100W (0.13hp)**



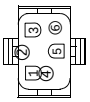
Type SGMAH-†	U	W	T	L	LL	LM	ΦS*	ΦLB**	QK	Output W (hp)	Approximate Mass lb (kg)	Allowable Radial Load lb (N)	Allowable Thrust Load lb (N)
A3□□F2C	0.047 (1.2)	0.079 (2)		4.96 (126)	3.98 (101)	1.44 (36.5)	0.24 (6)	1.18 (30)	0.55 (14)	30 (0.04)	1.32 (0.6)	15 (68)	12 (54)
A3□□F4C													
A5□□F2C				5.26 (133.5)	4.27 (108.5)	1.73 (44.0)				50 (0.07)	1.54 (0.7)		
A5□□F4C													
01□□F2C	0.07 (1.8)	0.12 (3)	0.12 (3)	6.3 (160)	5.31 (135)	2.42 (61.5)	0.31 (8)		0.55 (14)	100 (0.13)	1.76 (0.8)	18 (78)	
01□□F4C													

†Some motor dimensions vary for motors with the optional shaft seal: See p.15 for details.

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.2362	+0.0000-0.0003	1.181	+0.0000 -0.0008
	0.3150	+0.0000-0.0004		
mm	6.000	+0.000 -0.008	30.000	+0.000 -0.021
	8.000	+0.000 -0.009		

Connector Specifications:

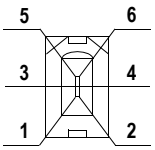
Motor Plug



Motor Connection		
1	Phase U	Red
2	Phase V	White
3	Phase W	Blue
4	FG (Frame Ground)	Green/Yellow
5	Brake Terminal	Red
6	Brake Terminal	Black

Plug: 350715-1 (AMP)
Pin: 350561-3 or 350690-3 (except No. 4)
Ground pin: 770210-1 (No. 4)
Mating connector:
Cap: 350781-1
Socket: 350570-3 or 350689-3

Encoder Plug



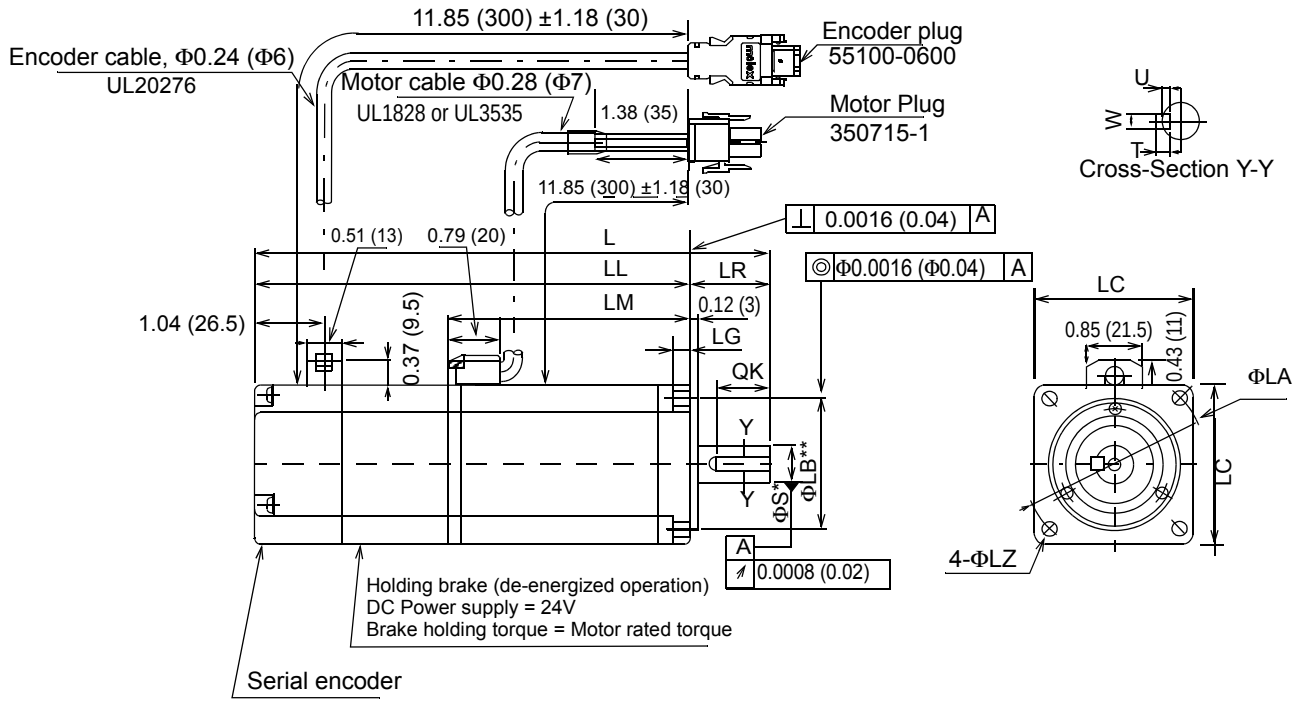
Encoder Connection		
1	PG 5V	Red
2	PG 0V	Black
3	Battery +	Orange
4	Battery –	White/Orange
5	Data +	Light Blue
6	Data -	White/Light Blue

Note: Pins number 3 and 4 are connectors used for 16-bit absolute encoder option only.

Plug: 55100-0600 (Molex)
Mating connector:
Socket: 54280-0600

(2) 13-Bit Incremental or 16-Bit Absolute Encoder, with Brake

- **200W (0.27hp), 400W (0.53hp), 750W (1.01hp)**



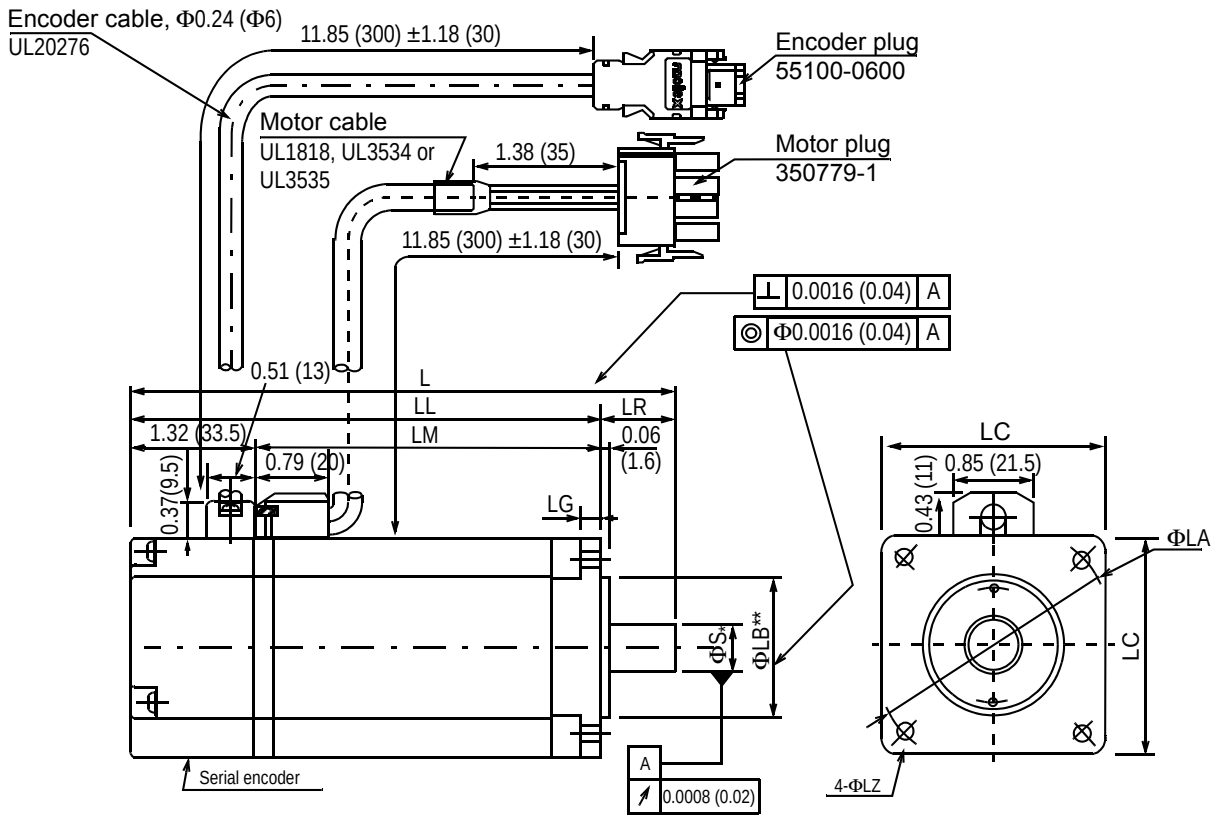
Type SGMAH-†	U	W	T	L	LL	LM	LR	LG	LC	ΦLA	ΦLZ	ΦS*	ΦLB**	QK	Output W (hp)	Approximate Mass lb (kg)	Allowable Radial Load lb (N)	Allowable Thrust Load lb (N)
02□□F4C	0.12 (3)	0.2 (5)		6.54 (166)	5.35 (136)	2.46 (62.5)	1.18 (30)	0.24 (6)	2.36 (60)	2.76 (70)	0.22 (5.5)	0.55 (14)	1.97 (50)	0.79 (20)	200 (0.27)	3.53 (1.6)	55 (245)	17 (74)
04A□F4C				7.64 (194)	6.46 (164)	3.56 (90.5)									400 (0.53)	4.85 (2.2)		
08A□F4C				9.04 (229.5)	7.46 (189.5)	4.37 (111)	1.57 (40)	0.31 (8)	3.15 (80)	3.54 (90)	0.28 (7)	0.64 (16)	2.76 (70)	1.18 (30)	750 (1.01)	9.48 (4.3)	88 (392)	33 (147)

†Some motor dimensions vary for motors with the optional shaft seal: See p.16 for details.

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.5512	+0.0000-0.0004	1.9685	+0 -0.0010
	0.6299	+0.0000-0.0004	2.7558	+0 -0.0012
mm	14.000	+0.000 -0.011	50.000	+0 -0.025
	16.000	+0.000 -0.011	70.00	+0 -0.03

(3) 13-Bit Incremental or 16-Bit Absolute Encoder, w/o Brake

- **200W (0.27hp), 400W (0.54hp) with NEMA 23* Flange/Pilot**



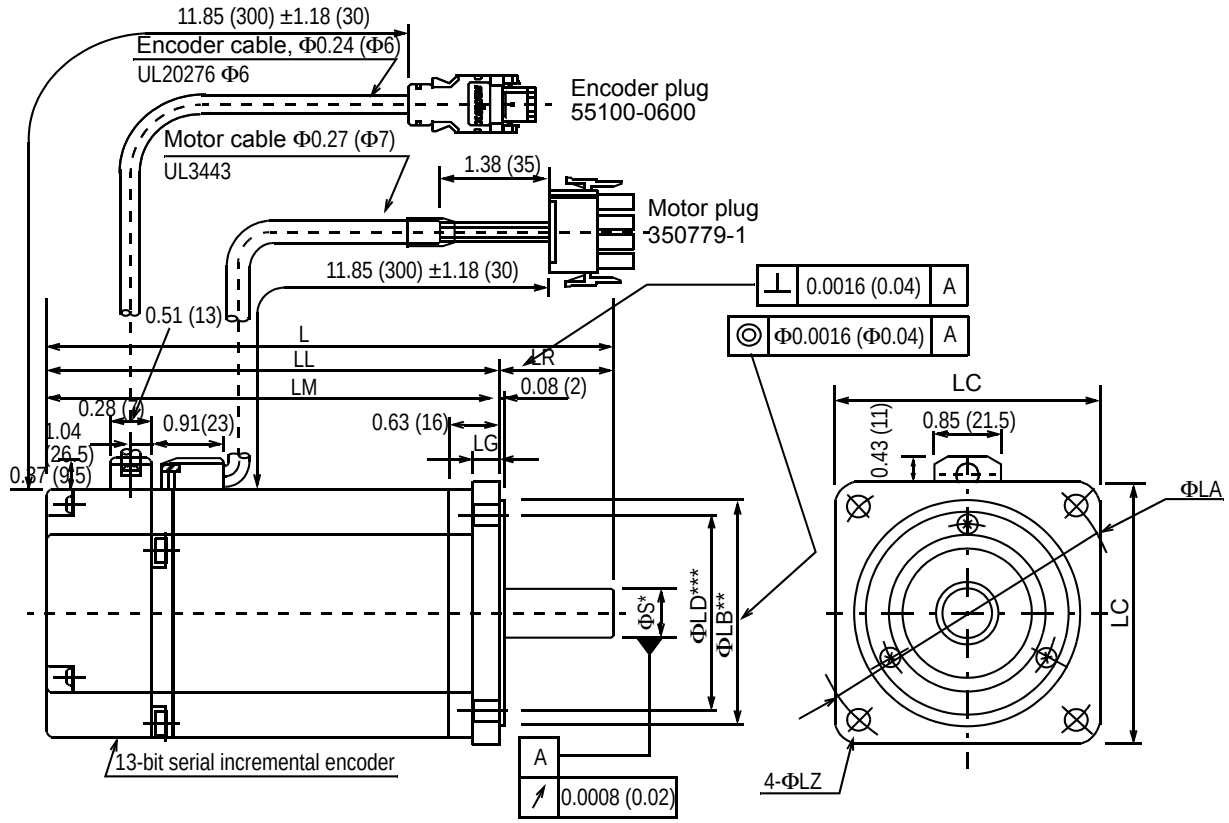
Type SGMAH-	L	LL	LM	LR	LG	LC	ΦLA	ΦLZ	ΦS*	ΦLB**	Output W (hp)	Approximate Mass lb (kg)	Allowable Radial Load lb (N)	Allowable Thrust Load lb (N)
02□□AN21	4.67 (118.5)	3.9 (98.5)	2.56 (65)	0.79 (20)	0.24 (6)	2.36 (60)	2.63 (66.7)	0.18 (4.5)	0.50 (12.7)	1.5 (38.1)	200 (0.27)	2.43 (1.1)	55 (245)	17 (74)
04□□AN21	5.77 (146.5)	5.0 (126.5)	3.66 (93)								400 (0.53)	3.75 (1.7)		

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.5000	+0 -0.00043	1.5000	+0.0000 -0.00098
mm	12.7	+0 -0.011	38.1	+0.000 -0.025

*For servo application torques: shaft diameter is 0.5in (12.7mm) rather than 0.25 (6.35mm), as is in typical NEMA 23.

(3) 13-Bit Incremental or 16-Bit Absolute Encoder, w/o Brake

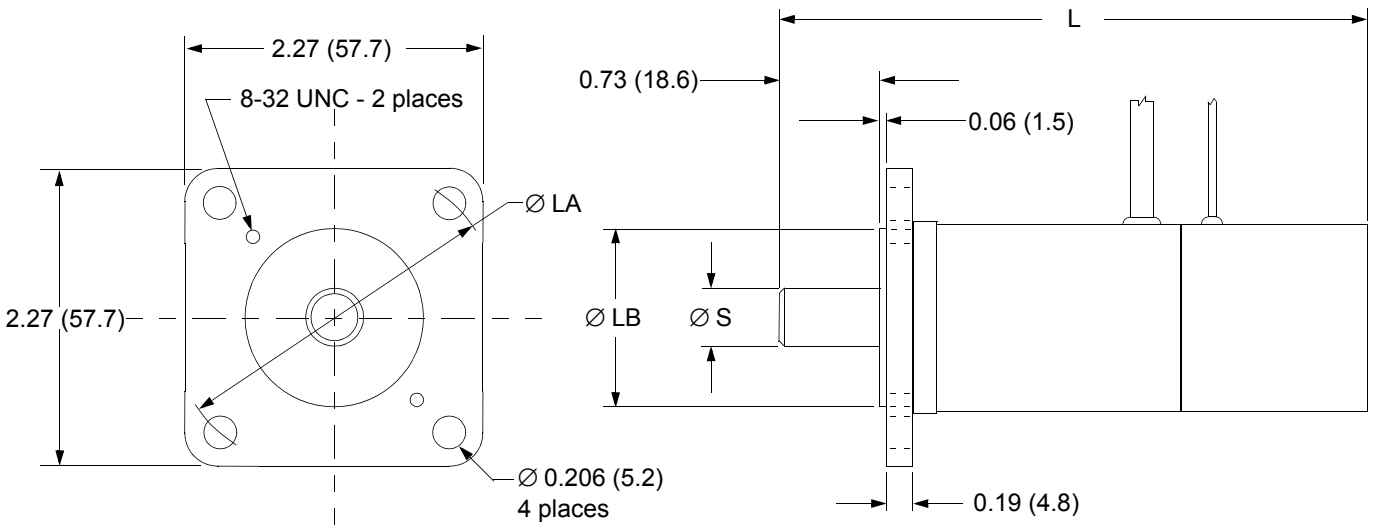
- **750W (1.01hp) with NEMA 34* Flange/Pilot**



Type SGMAH-	L	LL	LM	LR	LG	LC	ΦLA	ΦLZ	ΦS*	ΦLB**	ΦLD***	Output W (hp)	Approx Mass lb (kg)	Allowable Radial Load lb (N)	Allowable Thrust Load lb (N)
08AA□N21	7.20 (183)	5.75 (146)	4.43 (112.5)	1.46 (37)	0.31 (8)	3.35 (85)	3.87 (98.4)	0.28 (7)	0.63 (16)	2.87 (73)	2.60 (66)	750 (1.01)	7.5 (3.4)	88 (392)	33 (147)

Specified Tolerances						
Dimension	*ΦS		**ΦLB		**Φ*LD	
Unit	Diameter	Tolerance	Diameter	Tolerance	Diameter	Tolerance
in	0.625	+0.0000-0.00043	2.874	+0.0000 -0.0012	2.598	+0.00012 -0
mm	15.875	+0.000 -0.011	73.000	+0.000 -0.030	66.000	+0.003 -0

*For servo application torques: shaft diameter is 0.625in (15.875mm) rather than 0.375 (9.525mm), as is in typical NEMA 34.

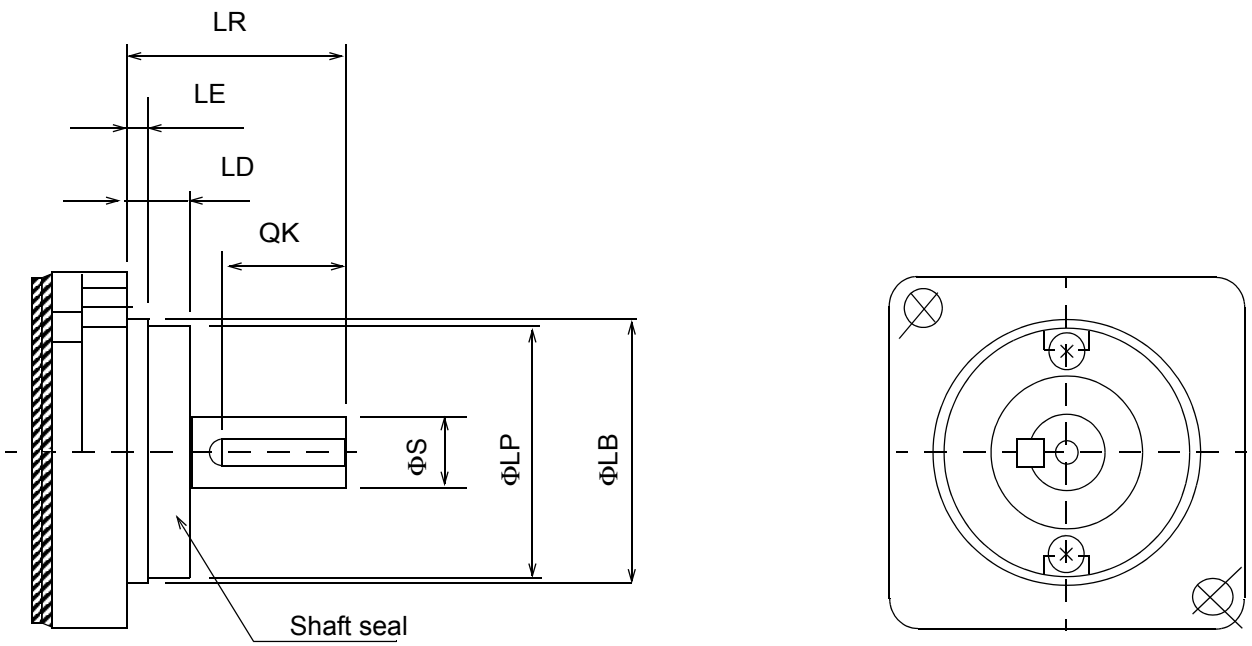


Motor Type	Dimensions* - Inch (mm)			
	L	∅ S	∅ LB	∅LA
SGMAH-A3 w/NEMA 23 Adaptor	3.72 (94.5)	0.2362 +.000 / -.0003 (6.0 +.000 / -.006)	1.500 +.002 / -.002 (38.1 +.05 / -.05)	2.625 (66.7)
SGMAH-A5 w/NEMA 23 Adaptor	4.02 (102)	0.2362 +.000 / -.0003 (6.0 +.000 / -.006)	1.500 +.002 / -.002 (38.1 +.05 / -.05)	2.625 (66.7)
SGMAH-01 w/NEMA 23 Adaptor	4.70 (119.5)	0.3150 +.000 / -.0004 (8.0 +.000 / -.009)	1.500 +.002 / -.002 (38.1 +.05 / -.05)	2.625 (66.7)

*Dimensions include a field installed SGM-N23 adapter flange on the listed motor.

Dimension Modifications for Motors with Optional Shaft Seal

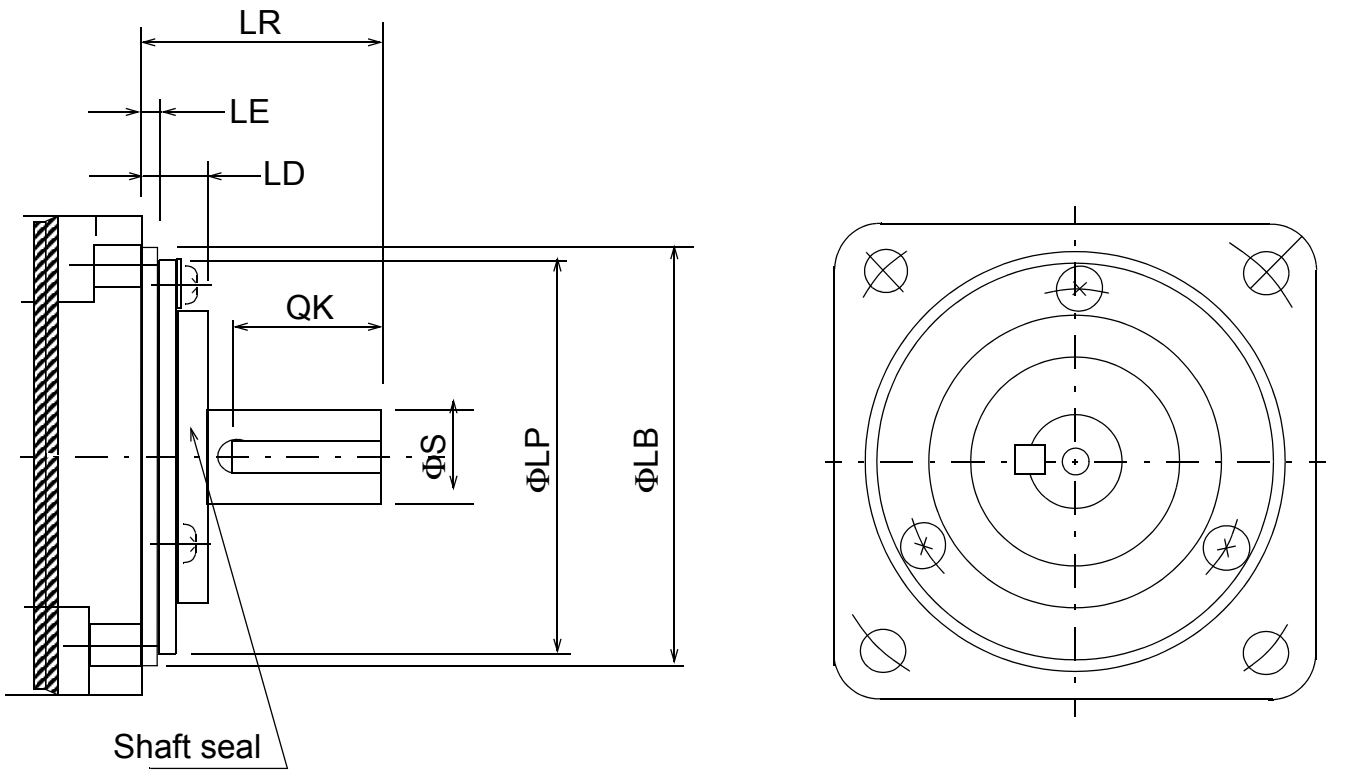
- **30W (0.04hp), 50W (0.07hp), 100W (0.13hp)**



Type SGMAH-	QK	ΦLB*	ΦS*	LE	LR	LD	ΦLP
A3	0.55 (14)	1.18 (30)	0.236 (6)	0.10 (2.5)	0.98 (25)	0.30 (7.5)	1.14 (28)
A5							
01			0.315 (8)				

*Tolerances for diameters LB and S are the same as those for motors without shaft seals.

- **200W (0.27hp), 400W (0.53hp), 750W (1.01hp)**



Type SGMAH-	QK	ΦLB*	ΦS*	LE	LR	LD	ΦLP
02	0.55 (14)	1.97 (50)	0.55 (14)	0.12 (3)	1.18 (30)	0.39 (10)	1.89 (48)
04							
08	0.98 (25)	2.76 (70)	0.63 (16)		1.57 (40)	0.43 (11)	2.60 (66)

*Tolerances for diameters LB and S are the same as those for motors without shaft seals.

Torque Reduction Factor for SGMAH motors equipped with a shaft seal:

Servo Motor Model	A3	A5	01	02	04	08
Torque Reduction Factor	70%	80%	90%	90%	95%	95%

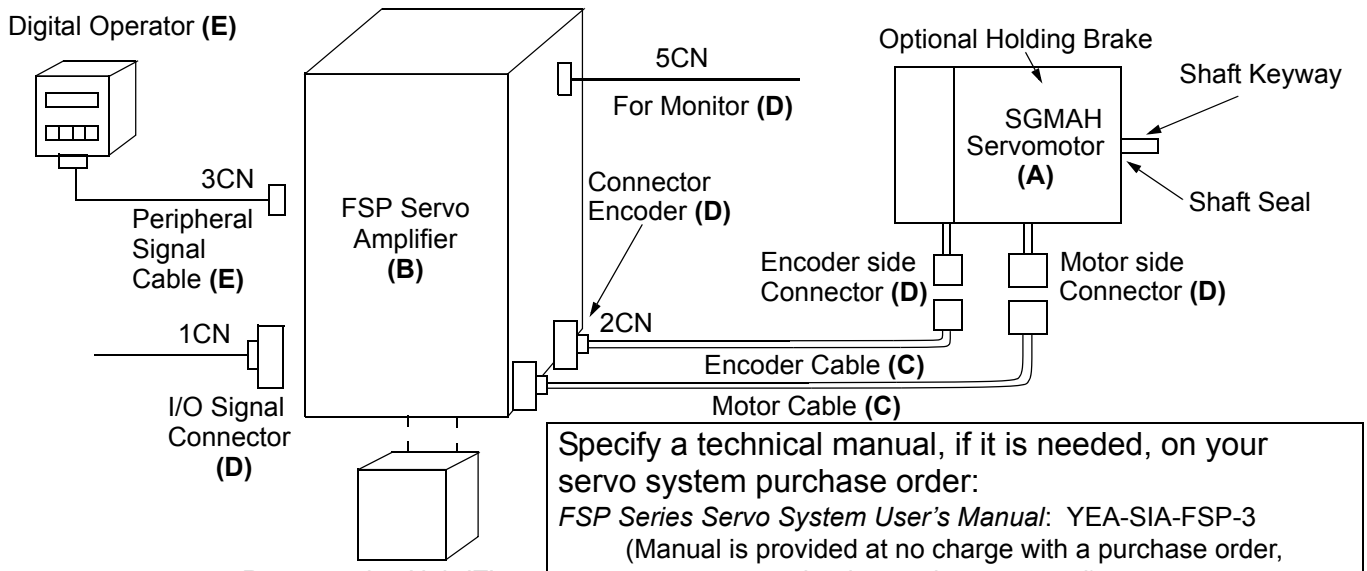
For example: The SGMAH-A3 continuous and peak torque rating should be reduced to 70% of the listed catalog specification.

To specify a motor with a shaft seal, refer to the motor part number explanation on the following page.

Selecting: SGMAH – FSP Sigma II Servo System

First, select the Sigma II servomotor suited for your application using SigmaSize, the Yaskawa servomotor sizing software, available at www.yaskawa.com. (You may also request SigmaSize software via e-mail, at: literature@yaskawa.com).
Use the diagram below to locate and identify the components of your system. Each item is letter-coded and cross-referenced in the option tables on the following pages.

System Configuration



Specify a technical manual, if it is needed, on your servo system purchase order:
FSP Series Servo System User's Manual: YEA-SIA-FSP-3
(Manual is provided at no charge with a purchase order, but it must be requested).

Model Number Designation

SGMAH - 01 A A F 4 1

Sigma II Servomotor Type
Rated Output
- A3: 30W (0.04hp)
- A5: 50W (0.07hp)
- 01: 100W (0.13hp)
- 02: 200W (0.25hp)
- 04: 400W (0.5hp)
- 08: 750W (1hp)

Power Supply
- A: 200V
- B: 100V

Accessories
- 1: Standard
- C: Standard with $24V_{DC}$ Brake*
- S: Standard with Shaft Seal*
- E: Standard with Brake & Shaft Seal*

Shaft Specifications
- 4: Straight Shaft with Keyway*
- 2: Straight Shaft without Keyway

Revision Level
- F: Standard
- N: NEMA flange (200W, 400W & 800W only without holding brake)

Encoder Specifications
- A: 13-bit (2048 x 4) Incremental Encoder
- 1: 16-bit (16384 x 4) Absolute Encoder

* Keyways, shaft seals, and holding brakes not available on motors with NEMA flanges (revision level = N).

Servomotor & Amplifier Selection

Use the table below to select the recommended SGMAH Sigma II servomotor and amplifier.
(Refer to the motor model # designation on the previous page specifying the available modification to motor construction/features.)

Motors Used with 13-bit Incremental Encoders (5000rpm Maximum)					Amplifier	
Description	Peak Torque (oz • in)	Rated Torque (oz • in)	Motor Inertia (oz • in • $s^2 \times 10^{-3}$)	Motor MODEL NUMBER **(A)**	Amplifier MODEL NUMBER **(B)*** Single-Phase FSP–	Amplifier Item Class *****
200V, Single-Phase Straight Shaft without Keyway	40.5	13.5	0.235	SGMAH-A3AAF21	A3AMC	NS
			0.355	SGMAH-A3AAF2C		
	67.7	22.6	0.312	SGMAH-A5AAF21	A5AMC	NS
			0.432	SGMAH-A5AAF2C		
	135	45.1	0.515	SGMAH-01AAF21	01AMC	S
			0.635	SGMAH-01AAF2C		
200V, Single-Phase, Straight Shaft with Keyway			0.515	SGMAH-01AAF41	01AMC	S
			0.635	SGMAH-01AAF4C		
	270	90.1	1.50	SGMAH-02AAF41	02AMC	S
			2.321	SGMAH-02AAF4C		
	542	181	2.45	SGMAH-04AAF41	04AMC	S
			3.271	SGMAH-04AAF4C		
	1010	338	9.52	SGMAH-08AAF41	08AMC-S	S
			11.5	SGMAH-08AAF4C		
200V, Single-Phase, Straight Shaft without Keyway NEMA flange	135	45.1	0.515	SGMAH-01AAF21**	01AMC	S
			0.635	SGMAH-01AAF2C**		
	270	90.1	1.50	SGMAH-02AAN21***	02AMC	S
	542	181	2.45	SGMAH-04AAN21***	04AMC	S
	1010	338	9.52	SGMAH-08AAN21****	08AMC-S	S
100V, Single-Phase, Straight Shaft without Keyway	40.5	13.5	0.235	SGMAH-A3BAF21	A3BMC	NS
			0.355	SGMAH-A3BAF2C		
	67.7	22.6	0.312	SGMAH-A5BAF21	A5BMC	NS
			0.432	SGMAH-A5BAF2C		
	135	45.1	0.515	SGMAH-01BAF21	01BMC	S
			0.635	SGMAH-01BAF2C		
100V, Single-Phase, Straight Shaft with Keyway			0.515	SGMAH-01BAF41	01BMC	S
			0.635	SGMAH-01BAF4C		
	270	90.1	1.50	SGMAH-02BAF41	02BMC	S
			2.321	SGMAH-02BAF4C		
100V, Single-Phase, Straight Shaft without Keyway NEMA flange	135	45.1	0.515	SGMAH-01BAF21**	01BMC	S
			0.635	SGMAH-01BAF2C**		
	270	90.1	1.50	SGMAH-02BAN21***	02BMC	S

Notes: $24V_{DC}$ brakes for SGMAH Sigma II servomotors are standard. Contact a local source for $24V_{DC}$ power supplies.
Motor power and encoder cables are factory pre-wired with approximately 13" lead length with amplifier mating connectors.
Use the tables on the following pages to specify mating connectors or pre-wired cables available in various lengths.
For technical information, request Yaskawa manual number YEA-SIA-FSP-3.
* For more detailed FSP amplifier specifications and dimensions, refer to pages 89 to 105.
** NEMA 23 adapter flange (see "Peripheral Device Selection")
*** NEMA 23 flange and pilot (See p.8)
**** NEMA 34 flange and pilot (See p.8)
***** Servomotors are stock, FSP–□□□MC amplifier status is shown.

Pre-wired Cable Selection

Use the table below to select pre-wired cables for your SGMAH Sigma II servomotor.

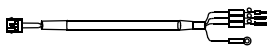
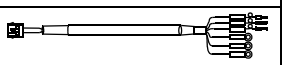
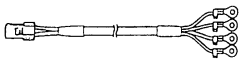
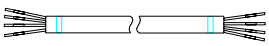
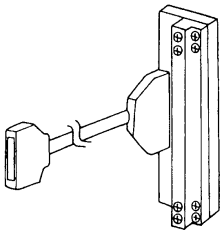
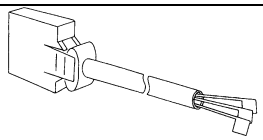
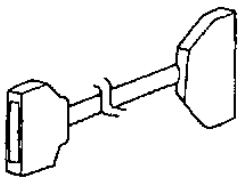
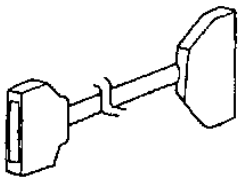
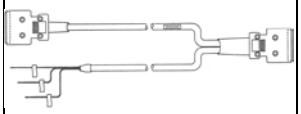
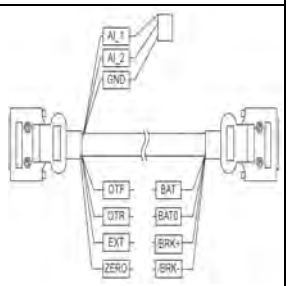
Cable Description **(C)**		Motor Size (kW)	Part Number*	Comments	Item Class
Power Cable without Brake		All	JZSP-CMM00-□□(A)	Use the following key to specify required cable length (last two digits of the part number): 03: 3m 05: 5m 10: 10m (standard) 15: 15m 20: 20m	Stock**
Power Cable with Brake			JZSP-CMM10-□□(A)		
Shielded Power Cable without Brake***			BAHCE-□□(A)		Limited Stock
Shielded Power Cable with Brake***			BAHBCE-□□(A)		
Encoder Cable (incremental and absolute)	–		AFAHCE–□□(A)		
Encoder feedback adapter cable for incremental and absolute*****	–		AFAD-P2(A)	Connects these full length encoder feedback cables to the FSP amplifier (Encoder feedback cables for SGDH amp) JZSP-CMP00-XX(A) A1ICE-XX(A) JZSP-CMP02-XX(B) 0.2 meter length	Stock
Encoder feedback adapter cable for absolute encoders. Cable has built in absolute encoder battery and case.	–		AFADABS-P2(A)	Connects these full length encoder feedback cables to the FSP amplifier (Encoder feedback cables for SGDH amp) JZSP-CMP00-XX(A) A1ICE-XX(A) JZSP-CMP02-XX(B) Built-in battery is: JZSP-BA01 0.2 meter length	
Encoder Cable (for applications up to 20m) Only for Solder Connections			FR-RMCT-SB	These cables are available in any length. For example, to order one FR-RMCT-SB cable, 16m long, specify: quantity: 16 part no.: FR-RMCT-SB	Stock
Encoder Cable (for applications from >20 to <50m maximum) Only for Solder Connections			UL20276-SB		Limited Stock

Table continued on next page.

Cable Description **(C)**		Motor Size (kW)	Part Number*	Comments	Item Class
Input/Output 1CN Cable & Transition Terminal Block		All	JUSP-TA50P	35mm DIN rail mountable; the cable length is 0.5 meters.	Stock
			JUSP–WA50P–□□	35mm DIN Rail mountable D50: 0.5 meters (standard) 01: 1 meter (standard) 02: 2 meters 03: 3 meters	
Input/Output 1CN Cable with Pigtail Leads			JZSP-CKI01-□(A)	Use the following key to specify required cable length (last digit of part number): 1: 1m (standard) 2: 2m 3: 3m	
Input/Output 1CN Cable with Female D-Sub output Connector****			JZSP-CKI0D-□□(A)	Use the following key to specify required cable length (last two digits of the part number): D50: 0.5m 01: 1m (standard) 02: 2m 03: 3m	
Input/Output 1CN SMC4000 to FSP Interface Cable			SMCCBL2□□	Use the Following key to determine the desired length specification. □□= 02: 2 Feet 05: 5 Feet 10: 10 Feet 15: 15 Feet	Stock**
Input/Output 1CN SMC4000 to FSP Interface Cable with prepared alarm and reset inputs. requires jumper in SMC4000			SMCCBLH□□		
Input/Output 1CN SMC4000 to FSP Interface Cable with flying leads for additional amplifier I/O			SMCCBLB□□		Limited Stock
Input/Output 1CN MP2000 series controller to FSP Interface Cable			JEPMC–W2040–□□	Use the Following key to determine the desired length specification. □□= A5: 0.5 meters 01: 1 meter 03: 3 meters	

* "(A)" at the end of the cable part number is the revision level. Revision level may be changed prior to this catalog reprinting.

** Standard cable lengths are Stock items; non-standard cable lengths are Limited Stock items.

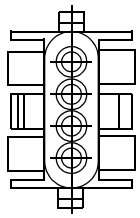
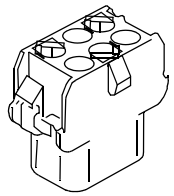
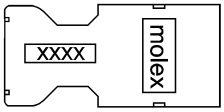
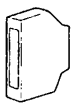
*** Use these power cables where it is important to meet CE (EMC) requirements.

**** 50 Pin Female D-Sub output connector mates to customer supplied third party terminal block. (e.g., Wago #289-449, Weidmuller #919658, Phoenix #2283647, Amphenol/Sine #20-51039, and many others).

***** For systems using the absolute encoder and this part number, the absolute encoder battery must be connected at the amplifier 1CN connector.

Connector Selection

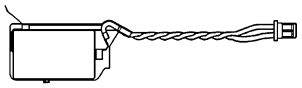
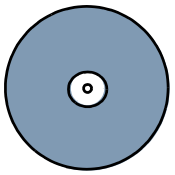
Use the table below to select mating connectors or kits for your SGMAH Sigma II servomotor.

Connector Description **(D)**		Motor Size (kW)	Part Number	Comments	Item Class
Motor Power Mating Connector (without Brake)		All	JZSP-CMM9-1	These connector kits include pin and socket. Requires use of Amp Crimp Tool (90548-1). (See below).	Stock
Motor Power Mating Connector (with Brake)			JZSP-CMM9-2		
Amp Crimp Tool	—		90548-1	Crimp tool for Motor Power Connector (JZSP-CMM9-□)	Limited Stock
2CN Amplifier Mating Connector			DE9406973*	—	Stock
Motor Encoder Mating Connector			JZSP-CMP9-2	—	
1CN Mating Connector			JZSP-CKI9	for FSP I/O 50-pin	
3CN Peripheral Mating Connector	—		YSC-1	—	
5CN Analog Monitor Connector	—		DE9404559	—	

* Alternative part number is DTCR6973

Peripheral Device Selection

Use the table below to select peripheral devices for your SGMAH Sigma II servomotor.

Component Description **(E)**		Part Number	Comments	Item Class
Absolute Encoder Battery		JZSP-BA01-1	3.6V, 1000mAh (lithium battery) with 5cm leads for wiring to 1CN	Stock
		JZSP-BA01	3.6V, 1000mAh (Lithium Battery) replacement battery for use in absolute adapter cable AFADABS-P2(A)	
Software Interface Cable	—	YS-12	Pre-wired 2.0m cable with 9-pin connector	
Flexworks		FSPGUI1, or download at www.yaskawa.com	—	
DC Reactor (for suppressing harmonics in the power supply)	For 200V: FSP-A3AMC	—	—	Limited Stock
	FSP-A5AMC	—		
	FSP-01AMC	X5071		
	FSP-02AMC	X5070		
	FSP-04AMC	X5069		
	FSP-08AMC-S	X5079		
	For 100V: FSP-A3BMC	—	—	
	FSP-A5BMC	—		
	FSP-01BMC	X5063		
	FSP-02BMC	X5062		
Individual External Regenerative Unit	50 Ω, 70W for A3, A5, 01, 02, 04, AND 08 AMPS	RH120-50ohmJ	This is a general purpose regenerative unit.* **Caution:** Proper set-up is necessary to avoid equipment damage.	Stock
NEMA Flange Adapter	—	SGM-N23	For 30, 50, and 100W SGMAH motors only. Complies to NEMA 23 mounting standard.	

* Refer to the FSP servo amplifier section , page 102 of this catalog for additional specifications, and the *FSP Series Servo System User's Manual* (YEA-SIA-FSP-3) for proper resistor sizing guidelines.

Flat Series
SGMPH Servomotors - With Incremental / Absolute Encoder

Rated Output: 100W, 200W, 400W, 750W, 1500W

For Additional Information	Page(s)
SGMPH Ratings & Specifications	24
SGMPH Speed/Torque Curves	25
SGMPH Dimensions	26 - 34
SGMPH Selection/Ordering Information	35 - 40
FSP Ratings & Specifications	91 - 97
FSP Dimensions	98 - 104

Design Features

1. **Compact**
   - The length is about 1/2 of conventional motors
   - Enhanced withstand load since motor output shaft bearing size is upgraded
   - Up to 5000rpm maximum speed
2. **Enhanced Environmental Resistance**
   - Water resistance (not including the shaft), IP67 standard
   - Optional shaft seals available
   - Reinforced lead-out cable access
3. **Encoders (reduced wiring serial encoder)**
   - 13-bit (2,048ppr x 4) incremental encoder (standard)
   - 16-bit (16,384ppr x 4) absolute encoder (option)
4. **Application Emphasis**
   - Chip mounters
   - PCB drilling machines
   - Robots
   - Conveyor
   - Packaging
5. **Certified International Standards**
   - UL, cUL recognized, (File #: E165827), CE compliance

Servomotor Ratings and Specifications

Time Rating:	Continuous	Enclosure:	Totally-enclosed, self-cooled	Excitation:	Permanent magnet
Insulation:	Class B	Ambient Temperature:	0 to 40ºC	Drive Method:	Direct drive
Vibration:	15μm or less	Ambient Humidity:	20 to 80% (non-condensing)	Mounting:	Flange-mounted
Withstand Voltage:	$1500V_{ac}$			Applicable Encoder:	
Insulation Resistance:	$500V_{DC}$ 10MΩ or more	Rated Rotation Speed:	3000rpm		13-bit Incremental and 16-bit Absolute encoder
		Maximum Rotation Speed:	5000rpm		

Applied Voltage	MOTORS: SGMPH-	Rated Output	Rated Torque		Instantaneous Peak Torque		Continuous Rated Current*	Maximum Peak Current*	Rated Angular Acceleration	Rated Power Rate
		W (hp)	oz • in	N • m	oz • in	N • m	A_{rms}	A_{rms}	rad/s^2	kW/s
$200V_{ac}$	01A	100 (0.13)	45.1	0.318	135	0.955	0.89	2.8	64800	20.6
	02A	200 (0.27)	90.2	0.637	270	1.91	2.0	6.0	33000	21.0
	04A	400 (0.54)	180	1.27	541	3.82	2.6	8.0	38500	49.0
	08A	750 (1.01)	338	2.39	1014	7.16	4.1	13.9	11400	27.1
	15A	1500 (2.01)	675	4.77	2025	14.3	7.5	23.0	11900	56.7
$100V_{ac}$	01B	100 (0.13)	45.1	0.318	135	0.955	2.2	7.1	64800	20.6
	02B	200 (0.27)	90.2	0.637	270	1.91	2.7	8.4	33000	21.0

* Values are calculated when the servomotor is combined with an FSP servo amplifier.

System Voltage	MOTORS SGMPH-	Moment of Inertia				Holding Brake (at 20°C)			Allowable Load Inertia *
		Motor without Brake		Motor with Brake		Capacity	Coil Resistance	Rated Current	
		$oz \cdot in \cdot s^2 \times 10^{-3}$	$KG \cdot m^2 \times 10^{-4}$	$oz \cdot in \cdot s^2 \times 10^{-3}$	$KG \cdot m^2 \times 10^{-4}$	W	Ω	A	$KG \cdot m^2 \times 10^{-4}$
$200V_{ac}$	01A	0.695	0.0491	1.106	0.0781	8.1	71	0.34	1.20
	02A	2.73	0.193	4.274	0.302	7.6	75.8	0.32	3.69
	04A	4.69	0.331	6.234	0.44	7.2	75.8	0.32	3.82
	08A	29.7	2.10	42.09	2.975	7.5	76.8	0.31	13.4
	15A	56.9	4.02	69.29	4.895	10	57.6	0.42	24.1
$100V_{ac}$	01B	0.695	0.0491	1.106	0.0781	8.1	71	0.34	1.20
	02B	2.73	0.193	4.274	0.302	7.6	75.8	0.32	3.69

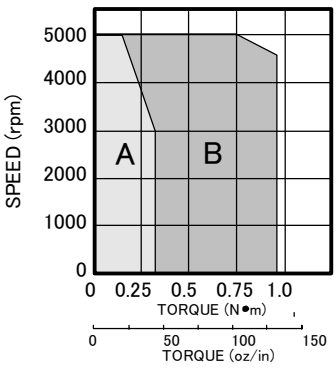
* Allowable load inertia (J_L) shows the range requiring no exterior regenerative unit. When these values are exceeded, application may be restricted or a regenerative unit may be required. Values are calculated when the servomotor is combined with an FSP servo amplifier.

MOTORS SGMPH-	Servomotor Capacity W	Holding Brake	
		Holding Torque	
		oz-in	N•m
01□	100	45	0.318
02□	200	90.2	0.637
04A	400	180	1.27
08A	750	338	2.39
15A	1500	675	4.77

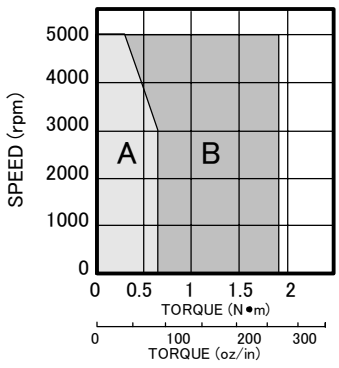
Speed / Torque Curves

200V

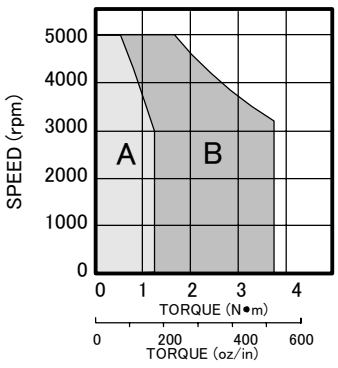
SGMPH-01A



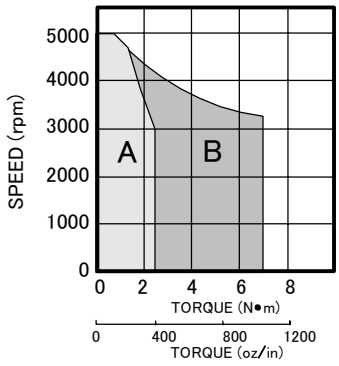
SGMPH-02A



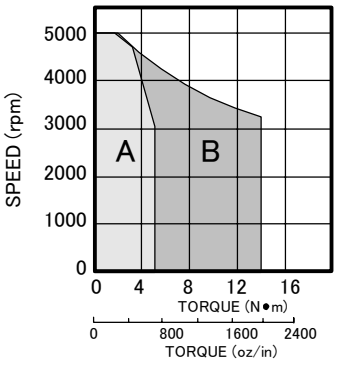
SGMPH-04A



SGMPH-08A

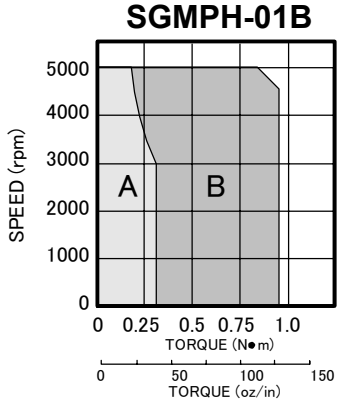


SGMPH-15A

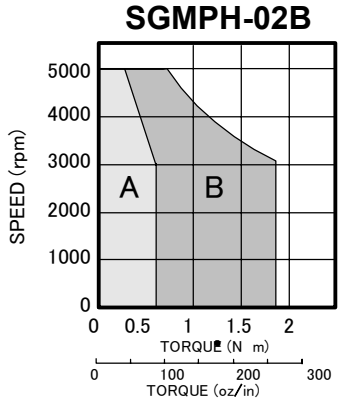


100V

SGMPH-01B



SGMPH-02B



A : CONTINUOUS DUTY ZONE

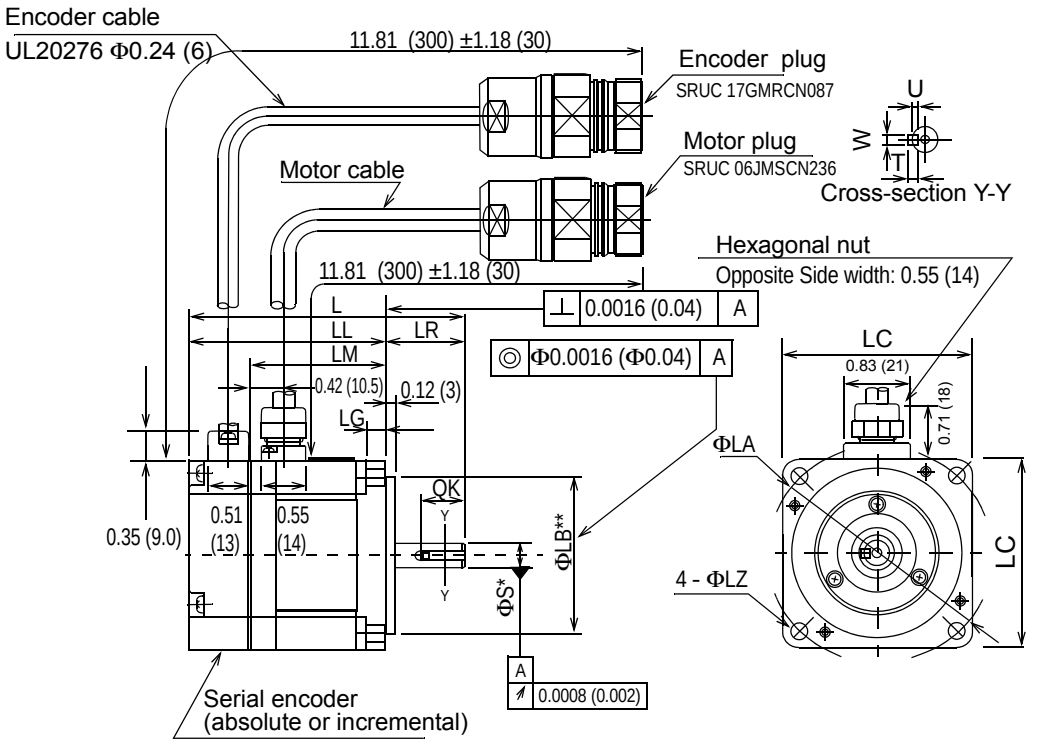
B : INTERMITTENT DUTY ZONE

Dimensions in inches (mm)

(1) 13-Bit Incremental or 16-Bit Absolute Encoder, w/o Brake

Note: 1. The keyway complies with JIS B1301-1976 (precision). A straight key is supplied.
2. Conforms to the IP67 enclosure, excluding the shaft (optional shaft seal available).
3. The quoted allowable radial load is the value at a position 5mm (0.2in) from the shaft end.

- **100W (0.13hp)**



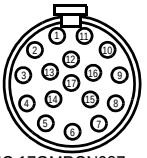
Type SGMPH-	L	LL	LM	LR	LG	LC	ΦLA	ΦLZ	ΦS*	ΦLB**	Key				Output W (hp)	Torque in•lb (N•m)	Time Rating	Rated Speed (rpm)	Approx Mass lb (kg)	Allowable Radial Load lb (N)	Allowable Thrust Load lb (N)
											QK	U	W	T							
01□□E41D	3.43 (87)	2.44 (62)	1.67 (42.5)	0.98 (25)	0.24 (6)	2.36 (60)	2.76 (70)	0.21 (5.3)	0.315 (8)	1.97 (50)	0.55 (14)	0.071 (1.8)	0.12 (3)	0.12 (3)	100 (0.13)	2.81 (0.318)	Continu-ous	3000	1.54 (0.7)	17.5 (78)	11.0 (49)
01□□E41D																					

Note: The quoted allowable radial load is the value at a position 0.79in (20mm.) from the mounting surface.

†Some motor dimensions vary for motors with the optional shaft seal: See p.34 for details.

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.3150	+0.0000-0.0004	1.9685	+0.0000 -0.0010
mm	8.000	+0.000 -0.009	50.000	+0.000 -0.025

Encoder Plug



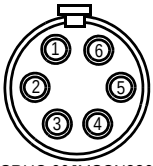
SRUC 17GMRCN087
(Interconnectron)

Incremental Terminal Specifications		
Pin No.	Description	Color
1*	Battery -	—
2*	Battery * (3.6V)	—
3	Data +	Blue
4	Data–	Blue/White
5 - 7, 10 - 17	Free	—
8	+5V (Power Supply)	Red
9	0V (Power Supply)	Black
Connector Case	FG (Frame Ground)	Shield wire

*Note: Incremental Terminal pins number 1 and 2 are connectors used for 16-bit absolute encoder option only.

Mating Connector: SPNA17HFRON16900E3
(Interconnectron)

Motor Plug



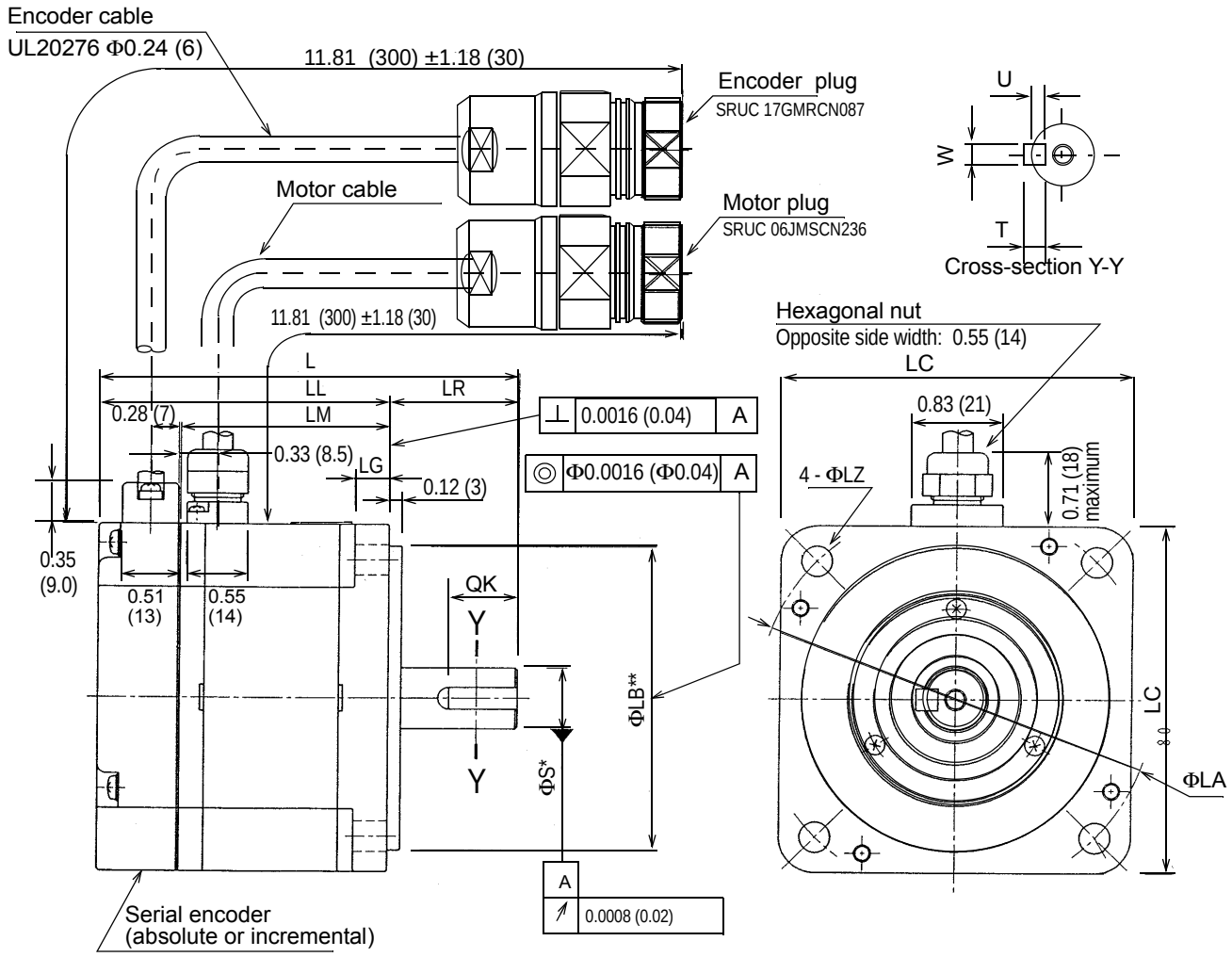
SRUC 06JMSCN236
(Interconnectron)

Motor Wiring Specifications		
Pin Number	Description	Color
1	Phase U	Red
2	Phase V	White
3	Phase W	Blue
6	FG (Frame Ground)	Green/Yellow

Mating Connector: SPNA06KFSDN169
(Interconnectron)

(1) 13-Bit Incremental or 16-Bit Absolute Encoder, w/o Brake

- **200W (0.27hp), 400W (0.53hp)**



Type SGMPH-	L	LL	LM	LR	LG	LC	ΦLA	ΦLZ	ΦS*	ΦLB**	Key				Voltage	Output	Torque	Time Rating	Rated Speed (rpm)	Approx Mass lb (kg)	Allowable Radial Load lb (N)	Allowable Thrust Load lb (N)
											QK	U	W	T	V	W (hp)	in•lb (N•m)					
02□□E41D	3.82 (97)	2.64 (67)	1.89 (48.1)	1.18 (30)	0.31 (8)	3.15 (80)	3.54 (90)	0.28 (7)	0.551 (14)	2.76 (70)	0.63 (16)	0.12 (3)	0.20 (5)	0.20 (5)	200	200 (0.27)	5.64 (0.637)	Continu-ous	3000	3.09 (1.4)	55.1 (245)	15.4 (68)
04□□E41D	4.61 (117)	3.46 (87)	2.68 (68.1)													400 (0.53)	11.2 (1.27)			4.63 (2.1)		

Note: The quoted allowable radial load is the value at a position 0.98in (25mm) from the mounting surface.

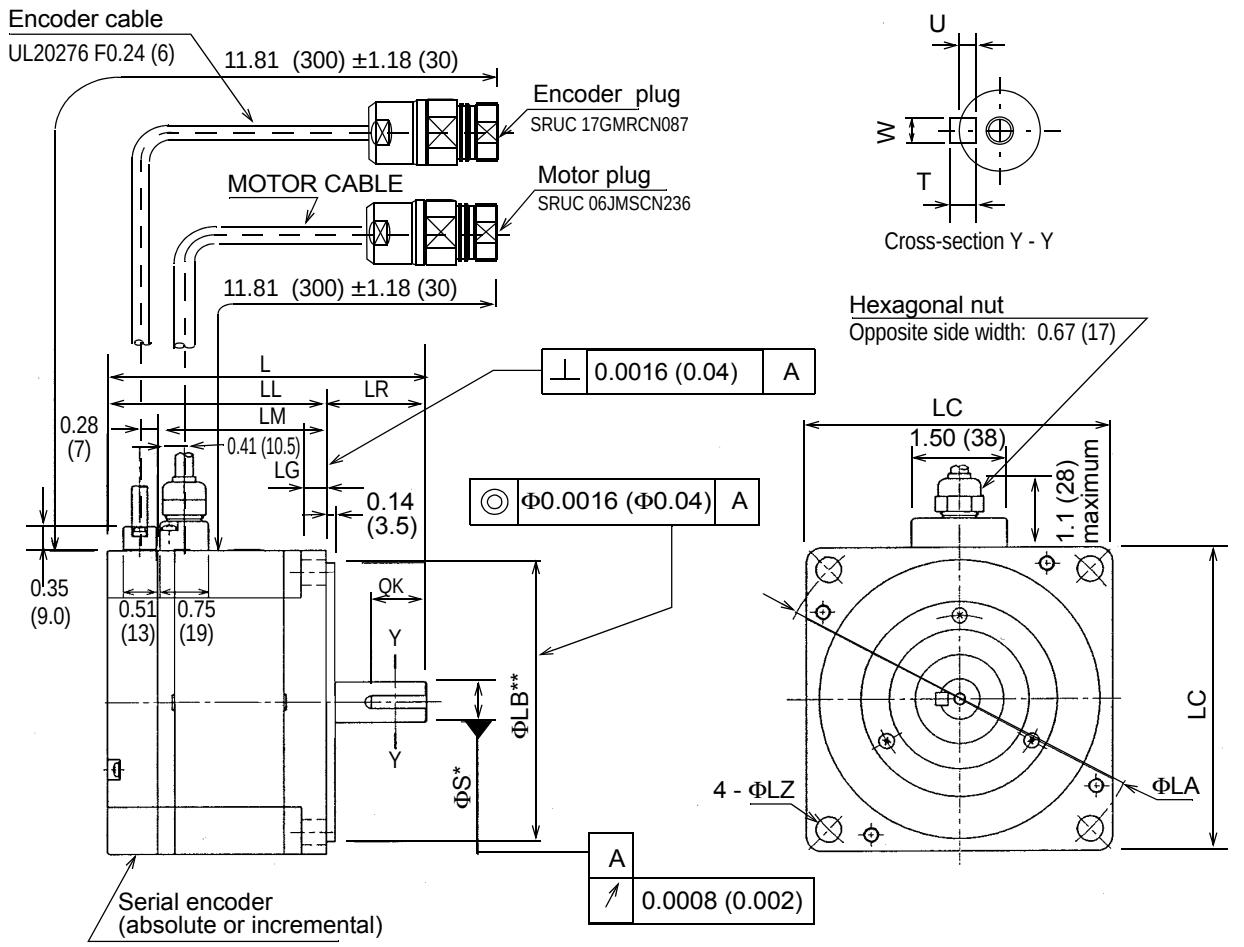
†Some motor dimensions vary for motors with the optional shaft seal: See p.34 for details.

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.5512	+0.0000-0.0004	2.7559	+0.0000 -0.0012
mm	14.000	+0.000 -0.011	70.000	+0.000 -0.030

Interconnectron Connector Specifications: See p.26.

(1) 13-Bit Incremental or 16-Bit Absolute Encoder, w/o Brake

- **750W (1.01hp)**



Type SGMPH-	L	LL	LM	LR	LG	LC	ΦLA	ΦLZ	ΦS*	ΦLB**	Key				Voltage V	Output W (hp)	Torque in•lb (N•m)	Time Rating	Rated Speed (rpm)	Approx Mass lb (kg)	Allowable Radial Load lb (N)	Allowable Thrust Load lb (N)
											QK	U	W	T								
08□□E41D	4.98 (126.5)	3.41 (86.5)	2.63 (66.7)	1.57 (40)	0.39 (10)	4.72 (120)	5.71 (145)	0.39 (10)	0.63 (16)	4.33 (110)	0.87 (22)	0.12 (3)	0.20 (5)	0.20 (5)	200	750 (1.01)	21.1 (2.39)	Contin-uous	3000	9.26 (4.2)	88.1 (392)	33.0 (147)

Note: The quoted allowable radial load is the value at a position 1.38in (35mm) from the motor mounting surface.

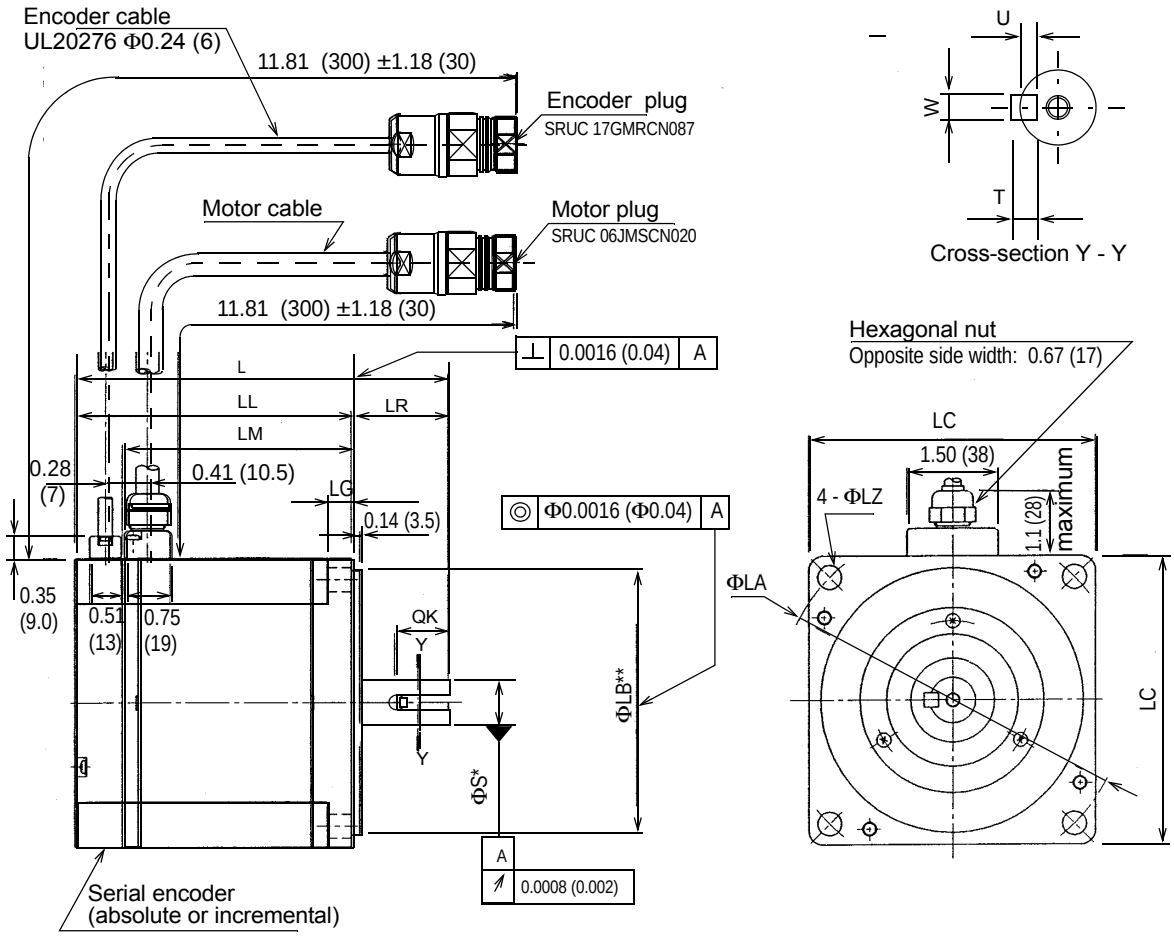
†Some motor dimensions vary for motors with the optional shaft seal: See p.34 for details.

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.6299	+0.0000-0.0004	4.3307	+0.0000 -0.0014
mm	16.000	+0.000 -0.011	110.000	+0.000 -0.035

Interconnectron Connector Specifications: See p.26.

(1) 13-Bit Incremental or 16-Bit Absolute Encoder, w/o Brake

- **1500W (2.0hp)**



Type SGMPH-	L	LL	LM	LR	LG	LC	ΦLA	ΦLZ	ΦS*	ΦLB**	Key				Voltage V	Output W (hp)	Torque in•lb (N•m)	Time Rating	Rated Speed (rpm)	Approx Mass lb (kg)	Allowable Radial Load lb (N)	Allowable Thrust Load lb (N)
											QK	U	W	T								
15☐☐E41D	6.08 (154.5)	4.51 (114.5)	3.73 (94.7)	1.57 (40)	0.39 (10)	4.72 (120)	5.71 (145)	0.39 (10)	0.75 (19)	4.33 (110)	0.87 (22)	0.14 (3.5)	0.24 (6)	0.24 (6)	200	1500 (2.0)	42.1 (4.77)	Continu-ous	3000	14.55 (6.6)	110 (490)	33.0 (147)

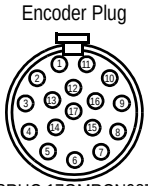
Note: The quoted allowable radial load is the value at a position 1.38in (35mm) from the motor mounting surface.

†Some motor dimensions vary for motors with the optional shaft seal: See p.34 for details.

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.7480	+0.0000-0.0005	4.3307	+0.0000 -0.0014
mm	19.000	+0.000 -0.013	110.000	+0.000 -0.035

Interconnection Connector Specifications

Encoder Plug



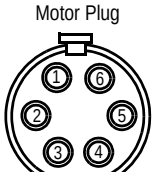
SRUC 17GMRCN087
(Interconnectron)

Incremental Terminal Specifications		
Pin Number	Description	Color
1*	Battery -	—
2*	Battery * (3.6V)	—
3	Data +	Blue
4	Data–	Blue/White
5 - 7, 10 - 17	Free	—
8	+5V (Power Supply)	Red
9	0V (Power Supply)	Black
Connector Case	FG (Frame Ground)	Shield wire

*Note: Incremental Terminal pins number 1 and 2 are connectors used for 16-bit absolute encoder option only.

Mating Connector: SPNA17HFRON16900E3 (Interconnectron)

Motor Plug



SRUC 06JMSCN020
(Interconnectron)

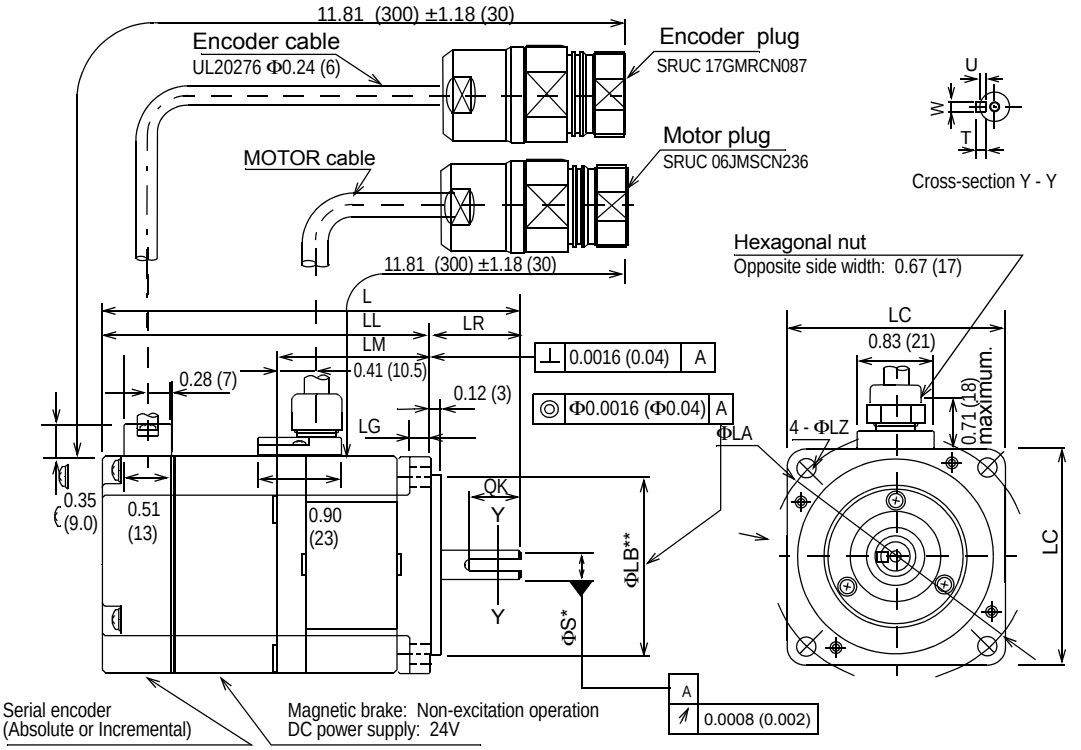
Motor Wiring Specifications		
Pin No.	Description	Color
1	Phase U	Red
2	Phase V	White
3	Phase W	Blue
6	FG (Frame Ground)	Green/Yellow

Mating Connector: SPNA06KFSDN169
(Interconnectron)

(2) 13-Bit Incremental or 16-Bit Absolute Encoder, with Brake

Note: 1. The keyway complies with JIS B1301-1976 (precision). A straight key is supplied.
2. The electromagnetic brake is only to hold the load in position and cannot be used to stop the motor.
3. Conforms to the IP67 enclosure, excluding the shaft (optional shaft seal available).

- **100W (0.13hp)**



Type SGMPH-	L	LL	LM	LR	LG	LC	ΦLA	ΦLZ	ΦS*	ΦLB**	Key				Voltage (V)	Output W (hp)	Torque in•lb (N•m)	Time Rating	Rated Speed (rpm)	Approx Mass lb (kg)	Allowable Radial Load lb (N)	Allowable Thrust Load lb (N)
											QK	U	W	T								
01□□E4CD	4.57 (116)	3.58 (91)	1.67 (42.5)	0.98 (25)	0.24 (6)	2.36 (60)	2.76 (70)	0.22 (5.5)	0.315 (8)	1.968 (50)	0.55 (14)	0.071 (1.8)	0.12 (3)	0.12 (3)	200	100 (0.13)	2.81 (0.318)	Contin-uous	3000	1.5 (0.7)	17.5 (78)	11.0 (49)

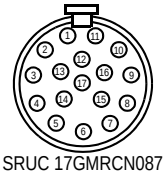
Note: The quoted allowable radial load is the value at a position 0.79in (20mm) from the motor mounting surface.

†Some motor dimensions vary for motors with the optional shaft seal: See p.34 for details.

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.3150	+0.0000-0.0004	1.9685	+0.0000 -0.0010
mm	8.000	+0.000 -0.009	50.000	+0.000 -0.025

Interconnection Connector Specifications

Encoder Plug



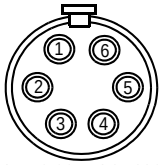
SRUC 17GMRCN087
(Interconnectron)

Incremental Terminal Specifications		
Pin Number	Description	Color
1*	Battery -	-
2*	Battery * (3.6V)	
3	Data +	Blue
4	Data–	Blue/White
5 - 7, 10 - 17	Free	-
8	+5V (Power Supply)	Red
9	0V (Power Supply)	Black
Connector Case	FG (Frame Ground)	Shield wire

*Note: Incremental Terminal pins number 1 and 2 are connectors used for 16-bit absolute encoder option only.

Mating Connector: SPNA17HFRON16900E3 (Interconnectron)

Motor Plug



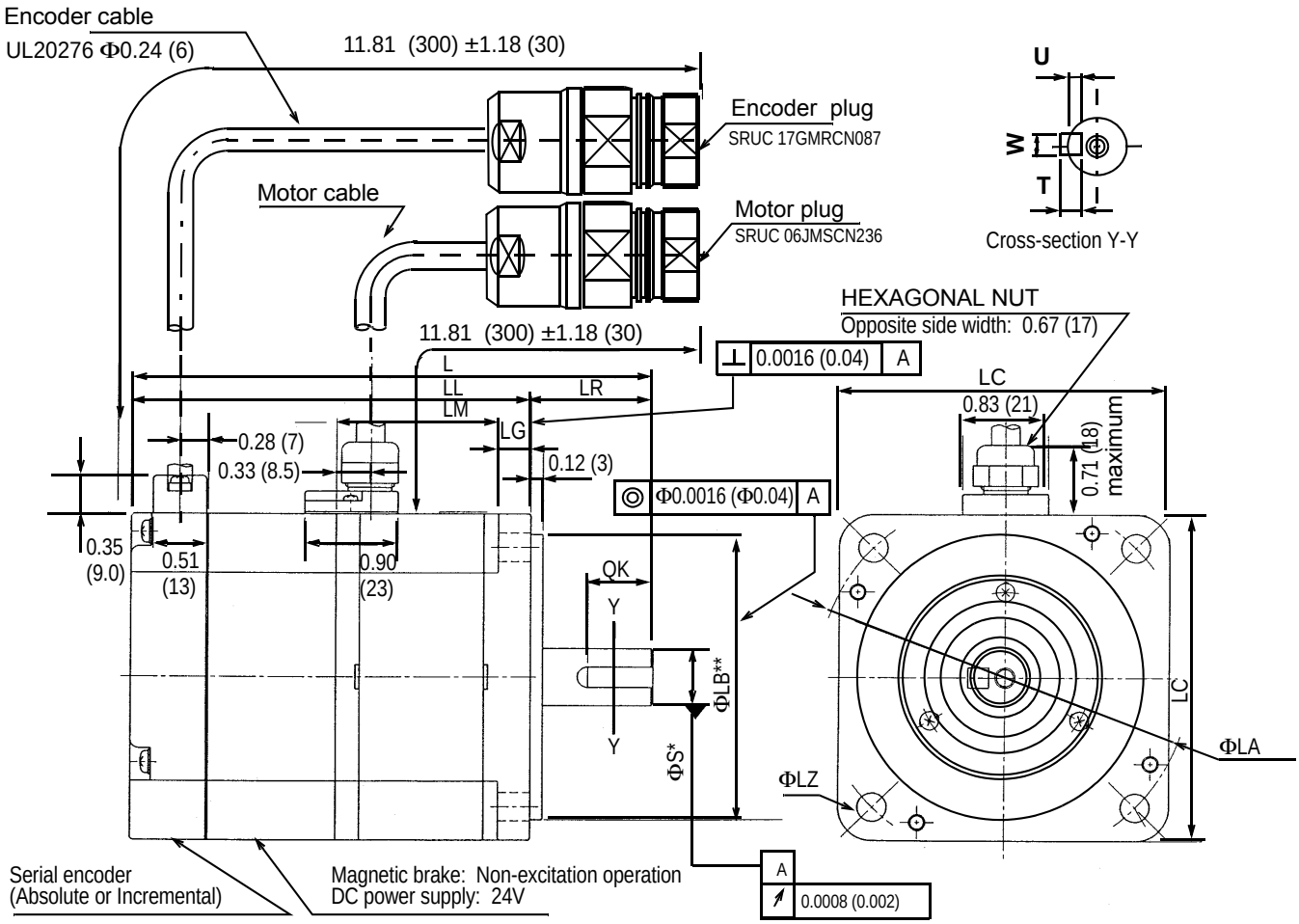
SRUC 06JMSCN236
(Interconnectron)

Motor Wiring Specifications		
Pin Number	Description	Color
1	Phase U	Red
2	Phase V	White
3	Phase W	Blue
4	Holding Brake	Black
5	Holding Brake	Black
6	FG (Frame Ground)	Green/Yellow

Mating Connector: SPNA06KFSDN169
(Interconnectron)

(2) 13-Bit Incremental or 16-Bit Absolute Encoder, with Brake

- **200W (0.27hp), 400W (0.53hp)**



Type SGMPH-	L	LL	LM	LR	LG	LC	ΦLA	ΦLZ	ΦS*	ΦLB**	Key				Voltage V	Output W (hp)	Torque in•lb (N•m)	Time Rating	Rated Speed (rpm)	Approx Mass lb (kg)	Allowable Radial Load lb (N)	Allowable Thrust Load lb (N)
											QK	U	W	T								
02□□E4CD	5.06 (128.5)	3.88 (98.5)	1.89 (48.1)	1.18 (30)	0.31 (8)	3.15 (80)	3.54 (90)	0.28 (7)	0.551 (14)	2.756 (70)	0.63 (16)	0.12 (3)	0.20 (5)	0.20 (5)	200	200 (0.27)	5.64 (0.637)	Contin-uous	3000	4.2 (1.9)	55.1 (245)	15.29 (68)
04□□E4CD	5.85 (148.5)	4.67 (118.5)	2.68 (68.1)												400	400 (0.53)	11.2 (1.27)			5.7 (2.6)		

Note: The quoted allowable radial load is the value at a position 0.98in (25mm) from the motor mounting surface.

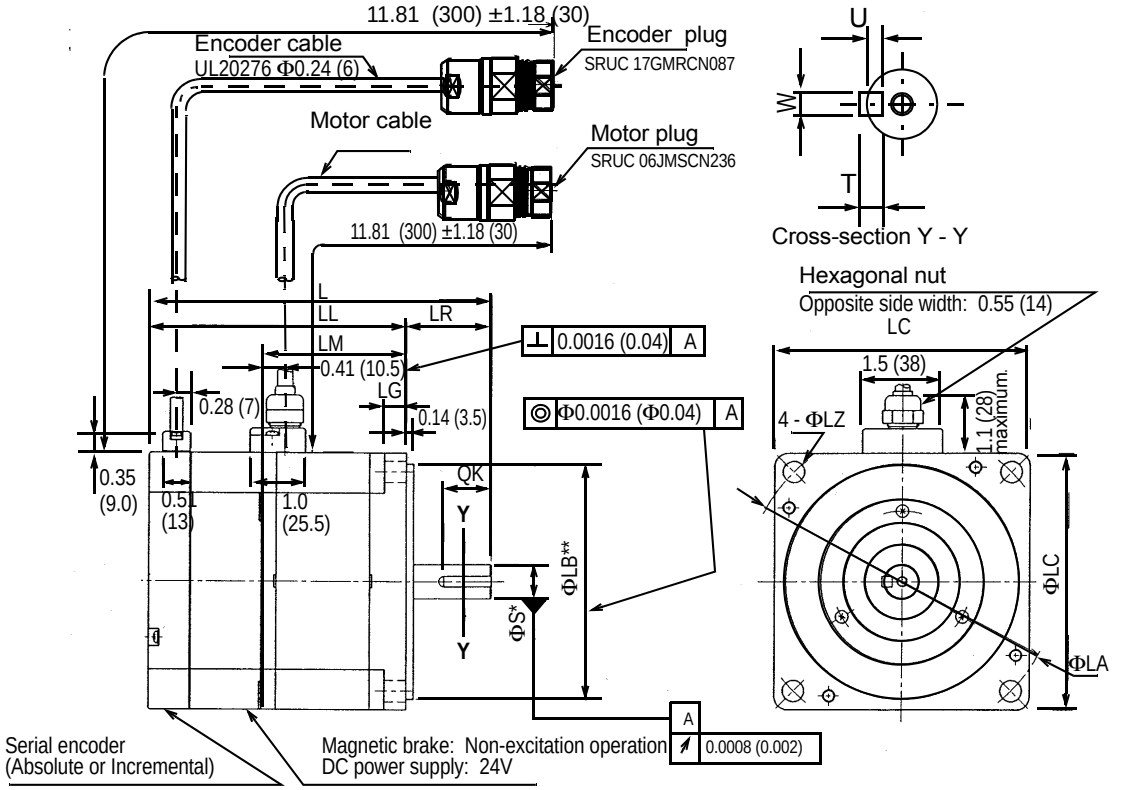
†Some motor dimensions vary for motors with the optional shaft seal: See p.34 for details.

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.5512	+0.0000-0.0004	2.7559	+0.0000 -0.0012
mm	14.000	+0.000 -0.011	70.000	+0.000 -0.030

Interconnectron Connector Specifications: See p.29.

(2) 13-Bit Incremental or 16-Bit Absolute Encoder, with Brake

- **750W (1.01hp)**



Type SGMPH-	L	LL	LM	LR	LG	LC	ΦLA	ΦLZ	ΦS*	ΦLB**	Key				Voltage V	Output W (hp)	Torque in•lb (N•m)	Time Rating	Rated Speed (rpm)	Approx Mass lb (kg)	Allowable Radial Load lb (N)	Allowable Thrust Load lb (N)
											QK	U	W	T								
08□□E4CD	6.42 (163)	4.84 (123)	2.63 (66.7)	1.57 (40)	0.39 (10)	4.72 (120)	5.71 (145)	0.39 (10)	0.63 (16)	4.33 (110)	0.87 (22)	0.12 (3)	0.20 (5)	0.20 (5)	200	750 (1.01)	21.15 (2.39)	Contin-uous	3000	12.6 (5.7)	88.1 (392)	33.0 (147)

Note: The quoted allowable radial load is the value at a position 1.38in (35mm) from the motor mounting surface.

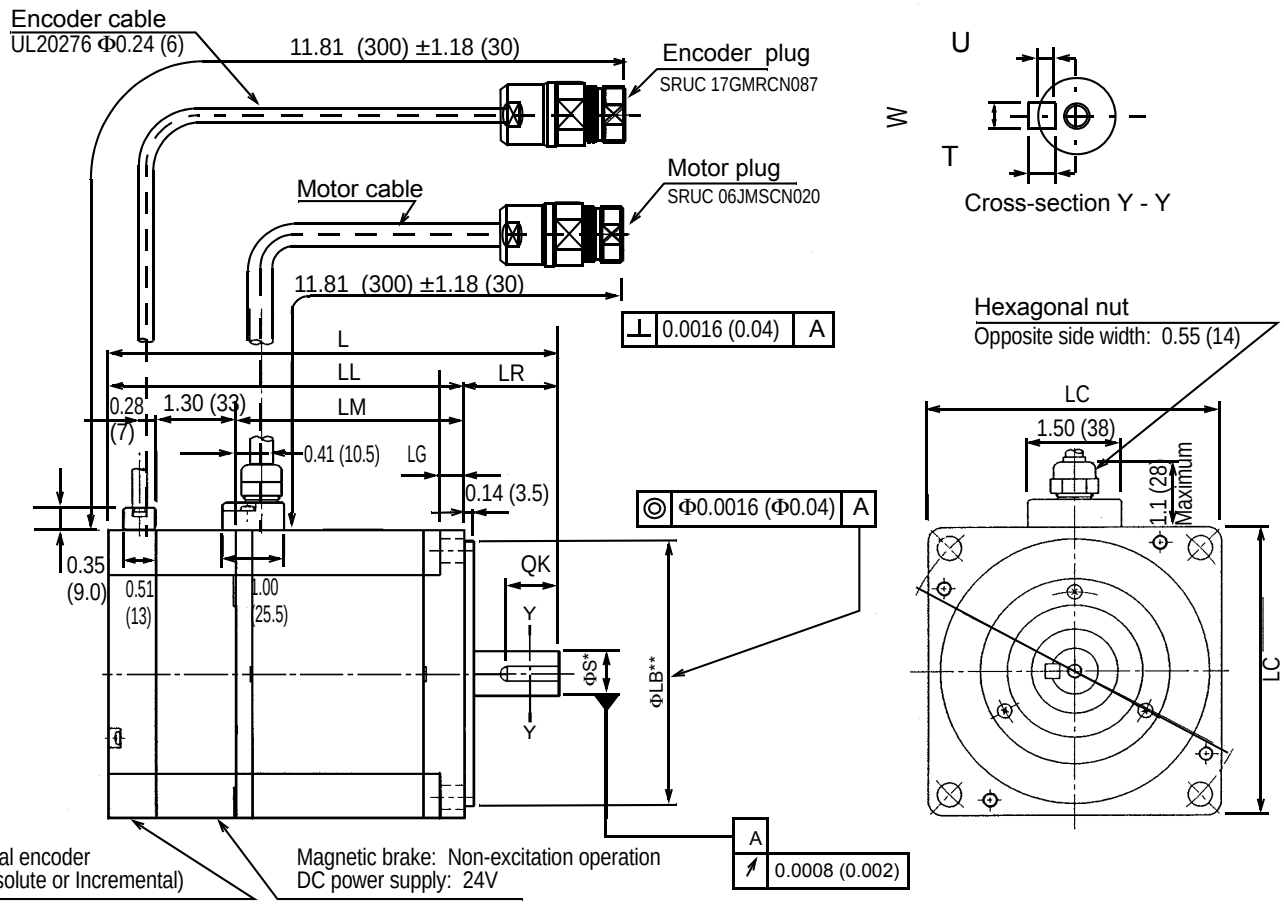
†Some motor dimensions vary for motors with the optional shaft seal: See p.34 for details.

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.6299	+0.0000-0.0004	4.3307	+0.0000 -0.0014
mm	16.000	+0.000 -0.011	110.000	+0.000 -0.035

Interconnectron Connector Specifications: See p.29.

(2) 13-Bit Incremental or 16-Bit Absolute Encoder, with Brake

- **1500W (2.0hp)**



Type SGMPH-	L	LL	LM	LR	LG	LC	ΦLA	ΦLZ	ΦS*	ΦLB**	Key				Voltage V	Output W (hp)	Torque in•lb (N•m)	Time Rating	Rated Speed (rpm)	Approx Mass lb (kg)	Allowable Radial Load lb (N)	Allowable Thrust Load lb (N)
											QK	U	W	T								
15☐☐E4CD	7.40 (188)	5.83 (148)	3.73 (94.7)	1.57 (40)	0.39 (10)	4.72 (120)	5.71 (145)	0.39 (10)	0.75 (19)	4.33 (110)	0.87 (22)	0.14 (3.5)	0.24 (6)	0.24 (6)	200	1500 (2.02)	42.1 (4.77)	Contin-uous	3000	17.9 (8.1)	110 (490)	33.0 (147)

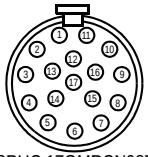
Note: The quoted allowable radial load is the value at a position 1.38in (35mm) from the motor mounting surface.

†Some motor dimensions vary for motors with the optional shaft seal: See p.34 for details.

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.7480	+0.0000-0.0005	2.7559	+0.0000 -0.0014
mm	19.000	+0.000 -0.013	70.000	+0.000 -0.035

Interconnection Connector Specifications

Encoder Plug



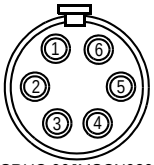
SRUC 17GMRCN087
(Interconnectron)

Incremental Terminal Specifications		
Pin Number	Description	Color
1*	Battery -	—
2*	Battery * (3.6V)	—
3	Data +	Blue
4	Data –	Blue/White
5 - 7, 10 - 17	Free	—
8	+5V (Power Supply)	Red
9	0V (Power Supply)	Black
Connector Case	FG (Frame Ground)	Shield wire

*Note: Incremental Terminal pins number 1 and 2 are connectors used for 16-bit absolute encoder option only.

Mating Connector: SPNA17HFRON16900E3 (Interconnectron)

Motor Plug

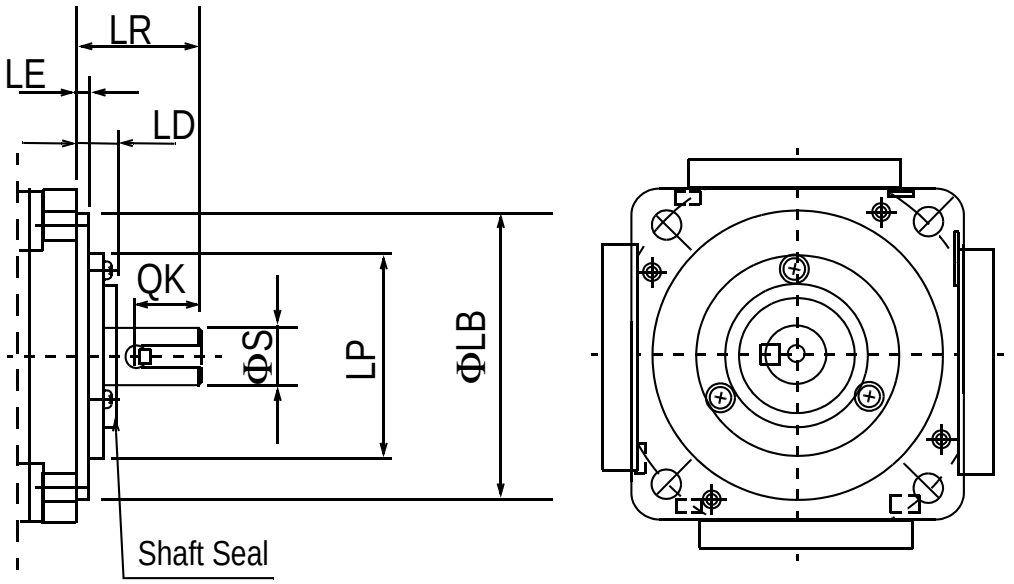


SRUC 06JMSCN020
(Interconnectron)

Motor Wiring Specifications		
Pin No.	Description	Color
1	Phase U	Red
2	Phase V	White
3	Phase W	Blue
4	Holding Brake	Black
5	Holding Brake	Black
6	FG (Frame Ground)	Green/Yellow

Mating Connector: SPNA06KFSDN169
(Interconnectron

Dimension Modifications for Motors with Optional Shaft Seal



Type SGMPH-	QK	ΦLB*	ΦS*	LE	LR	LD	ΦLP
01	0.55 (14)	1.97 (50)	0.31 (8)	0.12 (3)	0.98 (25)	0.28 (7)	1.54 (39)
02	0.64 (16)	2.76 (70)	0.55 (14)		1.18 (30)	0.39 (10)	1.93 (49)
04							
08	0.87 (22)	4.33 (110)	0.63 (16)	0.14 (3.5)	1.57 (40)	0.41 (10.5)	3.03 (77)
15			0.75 (19)				

*Refer to the following table for tolerances for diameters LB and S.

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.3150	+0.0000-0.0004	1.9685	+0.0000 -0.0010
	0.5512	+0.0000-0.0004	2.7559	+0.0000 -0.0014
	0.6299	+0.0000-0.0004	4.3307	+0.0000 -0.0014
	0.7480	+0.0000-0.0005		
mm	8.000	+0.000 -0.009	50.000	+0.000 -0.025
	14.000	+0.000 -0.011	70.000	+0.000 -0.035
	16.000	+0.000 -0.011	110.000	+0.000 -0.035
	19.000	+0.000 -0.013		

Torque Reduction Factor for SGMPH motors equipped with a shaft seal:

Servomotor Model	01	02	04	08	15
Torque Reduction Factor	90%	90%	95%	95%	95%

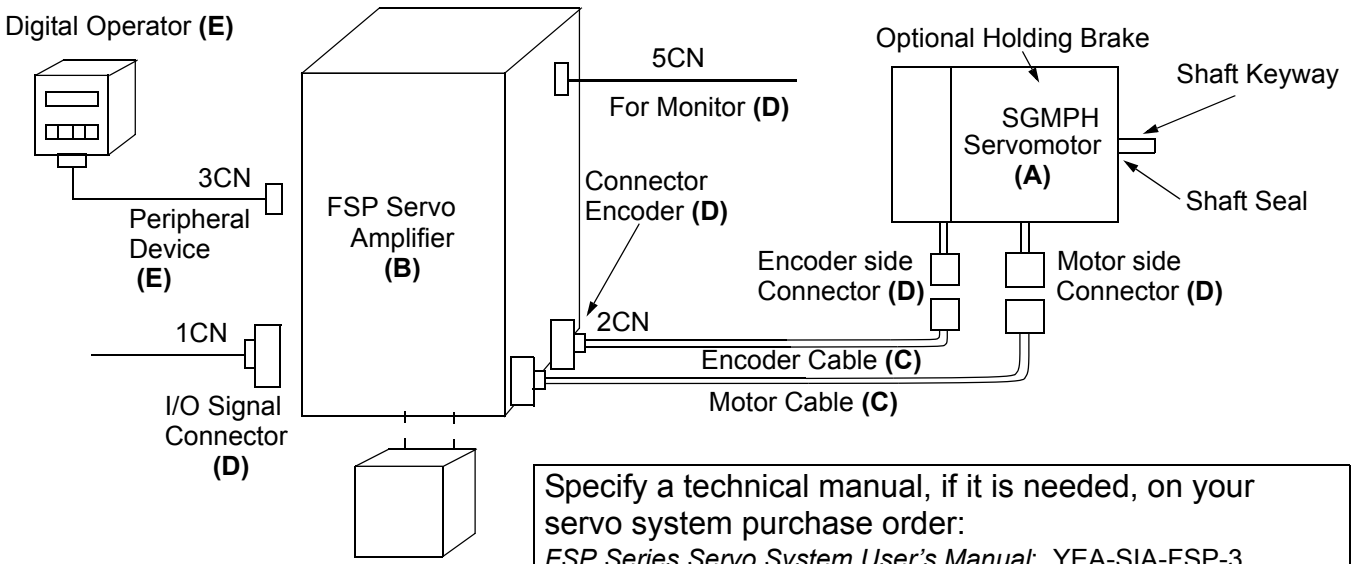
For Example: The SGMPH-01 continuous and peak torque rating should be reduced to 90% of the listed catalog specification.

To specify a motor with a shaft seal, refer to the motor part number explanation on the following page.

Selecting: SGMPH–FSP Sigma II Servo System

First, select the Sigma II servomotor suited for your application using SigmaSize, the Yaskawa servomotor sizing software, available at www.yaskawa.com. (You may also request SigmaSize software via e-mail, at: literature@yaskawa.com).
Use the diagram below to locate and identify the components of your system. Each item is letter-coded and cross-referenced in the option tables on the following pages.

System Configuration



Specify a technical manual, if it is needed, on your servo system purchase order:
FSP Series Servo System User's Manual: YEA-SIA-FSP-3
(Manual is provided at no charge with a purchase order, but it must be requested).

Model Number Designation

SGMPH - 01 A A E 4 1D

Sigma Servomotor Type
Rated Output
- 01: 100W (0.13hp)
- 02: 200W (0.25hp)
- 04: 400W (0.5hp)
- 08: 750W (1hp)
- 15: 1.5kW (2hp)

Power Supply
- A: 200V UL Recognized
- B: 100V UL Recognized

Accessories
- 1D: Standard
- CD: Standard with $24V_{DC}$ Holding Brake
- SD: Standard with Shaft Seal
- ED: Standard with Brake & Shaft Seal

Shaft Specifications
- 4: Straight Shaft with Keyway

Revision Level

Encoder Specifications
- A: 13-Bit (2048 x 4) Incremental Encoder
- 1: 16-Bit (16,384 x 4) Absolute Encoder

Servomotor & Amplifier Selection

Use the table below to select the appropriate SGMPH Sigma II servomotor and amplifier.
(Refer to the motor model # designation on the previous page specifying the available modification to motor construction/features.)

Description	Peak Torque (oz • in)	Rated Torque (oz • in)	Motor Inertia (oz • in • s^2x10^{-3})	Motor MODEL # **(A)**	Amplifier MODEL # **(B)*** 200V 1-Phase FSP-	Amplifier Item Class**
200V 13-Bit Incremental Encoder Straight Shaft with Keyway 5000rpm Pre-wired with Heavy Duty Connectors	135	45.1	0.917	SGMPH-01AAE41D	01AMC	Stock
			1.46	SGMPH-01AAE4CD		
	270	90.1	2.96	SGMPH-02AAE41D	02AMC	
			4.35	SGMPH-02AAE4CD		
	542	181	4.92	SGMPH-04AAE41D	04AMC	
			6.31	SGMPH-04AAE4CD		
	1010	338	29.9	SGMPH-08AAE41D	08AMC-S	
			35.7	SGMPH-08AAE4CD		
	2027	676	57.1	SGMPH-15AAE41D	15AMC-S	
			67.8	SGMPH-15AAE4CD		
100V, 1-Phase 13-Bit Incremental Encoder Straight Shaft with Keyway 5000rpm Pre-wired with Heavy Duty Connectors	135	45.1	0.917	SGMPH-01BAE41D	01BMC	
			1.46	SGMPH-01BAE4CD		
	270	90.1	2.96	SGMPH-02BAE41D	02BMC	
			4.35	SGMPH-02BAE4CD		

Notes: $24V_{DC}$ brakes for SGMPH Sigma II servomotors are standard. Contact a local source for $24V_{DC}$ power supplies. Motor power and encoder cables are factory pre-wired with approximately 13" lead length with heavy duty mating connectors.
Use the tables on the following page to specify mating connectors and/or various cable lengths.
For technical information, request Yaskawa manual number YEA-SIA-FSP-3.
* For more detailed FSP amplifier specifications and dimensions, refer to pages 89 to 105.
** Servomotors are stock, FSP–☐☐☐MC stock status is shown.

Pre-wired Cable Selection

Use the table below to select pre-wired cables for your SGMPH Sigma II servomotor.

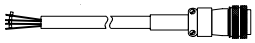
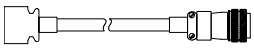
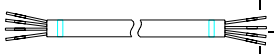
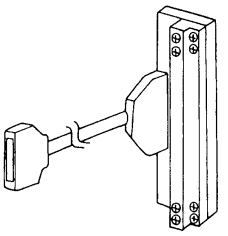
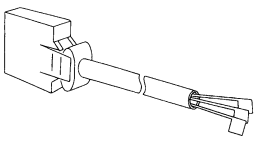
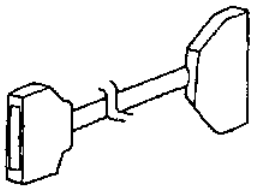
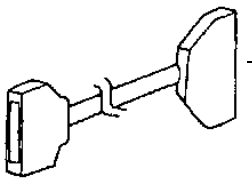
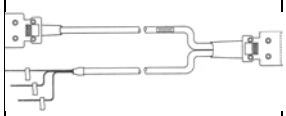
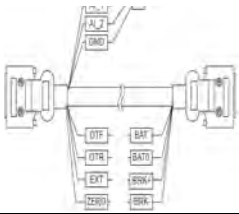
Cable Description **(C)**		Motor Size (kW)	Part Number*	Comments	Item Class
Power Cable with Interconnectron Connectors (without Brake)		0.1, 0.2, 0.4, 0.8	B4ICE-□□(A)	These UL and CE compliant cables are available in five lengths. Use two digits in the part number's last place: 03: 3m 05: 5m 10: 10m (standard) 15: 15m 20: 20m	Stock**
		1.5	B5ICE-□□(A)		
Power Cable with Interconnectron Connectors (with Brake) (IP67)		0.1, 0.2, 0.4, 0.8	B4IBCE-□□(A)		Limited Stock
		1.5	B5IBCE-□□(A)		
Encoder Cable with Interconnectron Connector (incremental or absolute) (IP67)		All	AFPHCE-□□(A)		Stock**
Encoder feedback adapter cable for incremental and absolute****	–		AFAD-P2(A)	Connects these full length encoder feedback cables to the FSP amplifier (Encoder feedback cables for SGDH amp) JZSP-CMP00-XX(A) A1ICE-XX(A) JZSP-CMP02-XX(B) 0.2 meter length	Stock
Encoder feedback adapter cable for absolute encoders. Cable has built in absolute encoder battery and case.	–		AFADABS-P2(A)	Connects these full length encoder feedback cables to the FSP amplifier (Encoder feedback cables for SGDH amp) JZSP-CMP00-XX(A) A1ICE-XX(A) JZSP-CMP02-XX(B) Built-in battery is: JZSP-BA01 0.2 meter length	
Encoder Cable (for applications up to 20m) Only for Solder Connections			FR-RMCT-SB	These cables are available in any length. For example, to order one FR-RMCT-SB cable, 16m long, specify: quantity: 16 part no.: FR-RMCT-SB	
Encoder Cable (for applications from >20 to <50m) Only for Solder Connections			UL20276-SB		

Table continued on next page.

Cable Description **(C)**		Motor Size (kW)	Part Number*	Comments	Item Class
Input/Output 1CN Cable & Transition Terminal Block			JUSP-TA50P	35mm DIN rail mountable; the cable length is 0.5 meters.	Stock
			JUSP–WA50P–☐☐	35mm DIN Rail mountable D50: 0.5 meters (standard) 01: 1 meter (standard) 02: 2 meters 03: 3 meters	
Input/Output 1CN Cable with Pigtail Leads			JZSP-CKI01-☐(A)	Use the following key to specify required cable length (last digit of part number): 1: 1m (standard) 2: 2m 3: 3m	
Input/Output 1CN Cable Cable with Female D-Sub output Connector***			JZSP-CKI0D-☐☐	Use the following key to specify required cable length (last two digits of the part number): D50: 0.5m 01: 1m (standard) 02: 2m 03: 3m	
Input/Output 1CN SMC4000 to FSP Interface Cable			SMCCBL2☐☐	Use the Following key to determine the desired length specification. ☐☐= 02: 2 Feet 05: 5 Feet 10: 10 Feet 15: 15 Feet	Stock**
Input/Output 1CN SMC4000 to FSP Interface Cable with prepared alarm and reset inputs. requires jumper in SMC4000			SMCCBLH☐☐		Limited Stock
Input/Output 1CN SMC4000 to FSP Interface Cable with flying leads for additional amplifier I/O			SMCCBLB☐☐		
Input/Output 1CN MP2000 series controller to FSP Interface Cable			JEPMC–W2040–☐☐	Use the Following key to determine the desired length specification. ☐☐= A5: 0.5 meters 01: 1 meter 03: 3 meters	

* The "(A)" at the end of the cable part number is the revision level. Revision level may be changed prior to catalog reprinting.

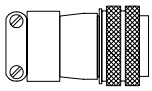
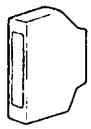
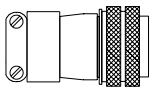
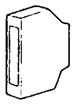
** Standard cable lengths are Stock items; non-standard cable lengths are Limited Stock items.

*** 50 Pin Female D-Sub output connector mates to customer supplied third party terminal block. (e.g., Wago #289-449, Weidmuller #919658, Phoenix #2283647, Amphenol/Sine #20-51039, and many others)

**** For systems using the absolute encoder and this part number, the absolute encoder battery must be connected at the amplifier 1CN connector.

Connector Selection

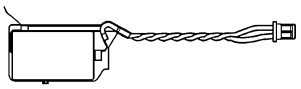
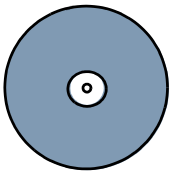
Use the table below to select mating connectors or kits for your SGMPH Sigma II servomotor.

Connector Description **(D)**		Motor Size (kW)	Part Number	Comments	Item Class
Interconnectron Connector for Motor Power Cable (with or without Brake) (IP67)		0.1, 0.2, 0.4, 0.8, 1.5	FIN07S-B2	Solder Cup	Stock
2CN Amplifier Mating Connector			DE9406973*	—	
Interconnectron Connector for Encoder Cable (incremental or absolute encoder) (IP67)			FIN17C-A2	Gauge: 24 - 18AWG Requires Crimp Tool B150 and positioner	
2CN Amplifier Mating Connector		All	JZSP-CKI9	–	
Interconnectron Crimp Tool	—		B150	—	Limited Stock
Positioner	—		B055/A	—	

*Alternative Part # is DTCR6973.

Peripheral Device Selection

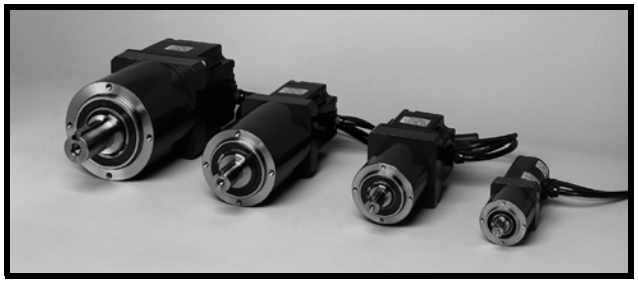
Use the table below to select peripheral devices for your SGMPH Sigma II servomotor.

Component	Description **(E)**	Part Number	Comments	Item Class
Absolute Encoder Battery		JZSP-BA01-1	3.6V, 1000mAh (lithium battery) with 5cm leads for wiring to 1CN	Stock
		JZSP-BA01	3.6V, 1000mAh (Lithium Battery) replacement battery for use in absolute adapter cable AFADABS-P2(A)	
Software Interface Cable	—	YS-12	Pre-wired 2.0m cable with 9-pin connector	
Flexworks		FSPGUI1 or download at www.yaskawa.com	–	
Individual External Regenerative Unit	For: FSP-01A□□ FSP-02A□□ FSP-04A□□ FSP-08A□□-S	RH12050ohmJ	These are general purpose regenerative units.* **Caution:** Proper set-up is necessary to avoid equipment damage.	
	For: FSP-15D□□ FSP-15A□□-S	RH500N25_ohmK		
DC Reactor (for suppressing harmonics in the power supply)	For 200V: FSP-01AMC FSP-02AMC FSP-04AMC FSP-08AMC-S FSP-15AMC-S	X5071 X5070 X5069 X5079 X5078	—	Limited Stock
	For 100V: FSP-01BMC FSP-02BMC	X5063 X5062		

* For an alternate solution, specify the individual resistor part number RH500N25_OHMK in necessary series or parallel connection. Refer to the FSP servo amplifier section of this catalog for additional specifications, and the *FSP Series Servo System User's Manual* (YEA-SIA-FSP-3) for proper resistor sizing guidelines.

SGMPH Gearmotors - With Incremental / Absolute Encoder

Rated Output : 100W, 200W, 400W,
750W, 1500W



For Additional Information	Page(s)
SGMPH Gearmotor Ratings & Specifications	42 - 43
SGMPH Gearmotor Dimensions	44 - 45
SGMPH Gearmotor Selection/Ordering Information	46 - 51
FSP Ratings & Specifications	91 - 97
FSP Dimensions	98 - 104

Design Features

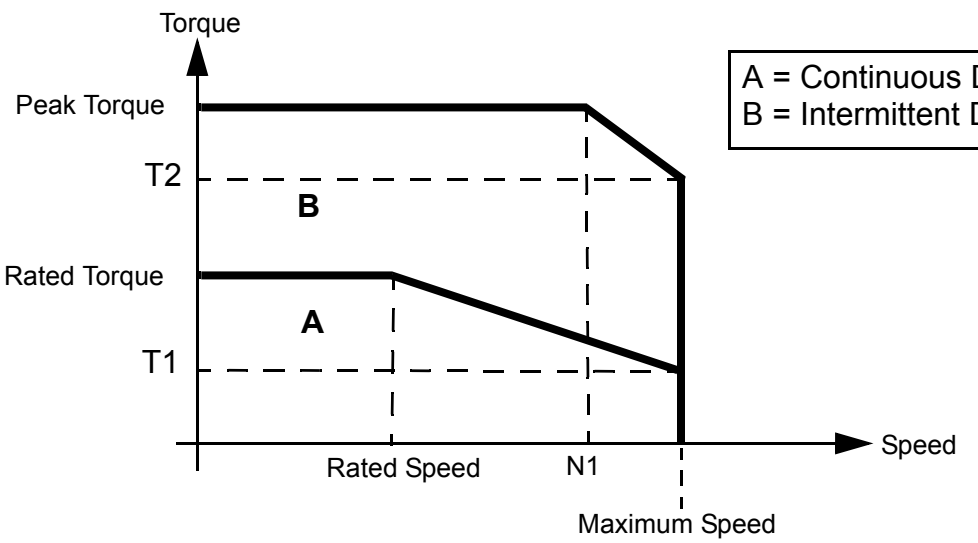
1. **Compact Construction**
   - Easy to install - pre-engineered and pre-assembled
   - Ideal for cyclic and reversing applications
   - Fits in limited mounting space
   - Planetary gear geometry allowing high output torques in a compact package
2. **Torque**
   - 40.9 to 3540in • lb peak torque
   - Cost-effective solution for low speed and high torque applications
   - Gear ratios - 5:1 to 100:1 in some sizes
   - High torsional stiffness and low backlash
   - Lubrication is self-replenishing to ensure long life
3. **Encoders**
   - 13-Bit (2,048ppr x 4) incremental encoder (standard)
   - 16-Bit (16,384ppr x 4) absolute encoder (option)
4. **Enclosure**
   - Motor is totally enclosed, self-cooled IP67 (not including shaft)
5. **Application Emphasis**
   - PCB drilling machines
   - Robots
   - Conveyors
   - Packaging machines
6. **Certified International Standards**
   - UL, cUL recognized (File #: E165827), CE compliance

Gearmotor Ratings and Specifications

GEARMOTOR Part Number	Rated Torque (in • lb)	Peak Torque (in • lb)	Rated Speed (rpm)	Maximum Speed (rpm)	Speed N1 (rpm)	Torque T1 (in • lb)	Torque T2 (in • lb)	Amplifier Model Number Analog Input FSP-
SG05SA-PE01□□	13.67	40.93	600	1000	900	8.59	34.34	01□MC
SG10SA-PE01□□	27.34	81.84	300	500	450	17.17	68.68	
SG25SA-PE01□□	66.95	200.39	120	200	180	42.04	168.16	
SG50SA-PE01□□	133.89	283.00	60	100	90	84.08	336.32	
SG1ASA-PE01□□	267.78	637.00	30	50	45	168.16	672.65	
SG05SA-PE02□□	27.34	81.84	600	1000	1000/600	17.17	81.8/36.2*	02□MC
SG10SA-PE02□□	54.68	163.69	300	500	500/300	34.34	163.7/72.4*	
SG25SA-PE02□□	133.89	283.00	120	200	200/120	84.08	283/177*	
SG50SA-PE02□□	267.78	708.00	60	100	100/60	168.16	708/354.7*	
SG1ASA-PE02□□	535.56	1593.00	26	48	50/30	336.32	1593/704.4*	
SG05SA-PE04□□	54.81	164.42	600	1000	640	34.34	77.27	04□MC
SG10SA-PE04□□	109.61	283.00	300	500	320	68.68	154.53	
SG25SA-PE04□□	268.38	708.00	120	200	128	168.16	378.36	
SG50SA-PE04□□	536.75	1610.25	52	96	64	336.32	756.73	
SG1ASA-PE04□□	1073.50	2832.00	20	36	32	672.65	1513.45	
SG05SA-PE08□□	102.34	306.04	600	1000	640	51.51	51.51	08□MC-S
SG10SA-PE08□□	204.67	612.07	300	500	320	103.02	103.02	
SG25SA-PE08□□	501.13	1498.63	104	192	128	252.24	252.24	
SG50SA-PE08□□	1002.25	2997.25	40	72	64	504.48	504.48	
SG05SA-PE15□□	205.16	614.50	520	960	640	103.02	103.02	15□MC-S
SG10SA-PE15□□	410.31	1228.99	260	480	320	206.04	206.04	
SG25SA-PE15□□	1004.63	3009.13	80	144	128	504.48	504.48	
SG50SA-PE15□□	2009.25	3540.00	40	72	64	1008.97	1008.97	

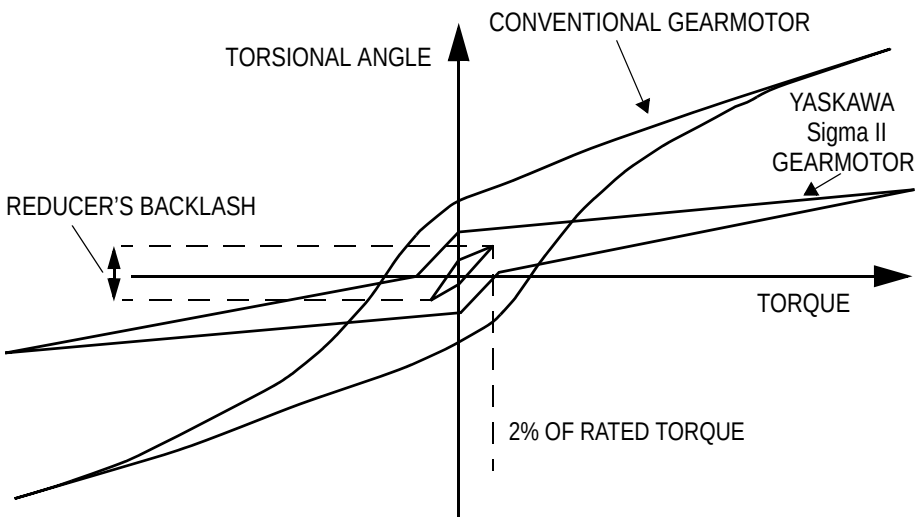
* Values for 100V Gearmotor

Note: 1. These performance ratings apply when duty cycles are 60% or less, and when the gearmotor runs for 1,000 cycles per hour or less. Contact your Yaskawa representative when duty cycles exceed 60%, and when the gearmotor runs for more than 1,000 cycles per hour.
2. Rated Speed is at 20°C ambient temperature. Reduce Rated Speed by 20% at 40°C ambient temperature.
3. For right-angle gearmotors, please consult the factory for availability.

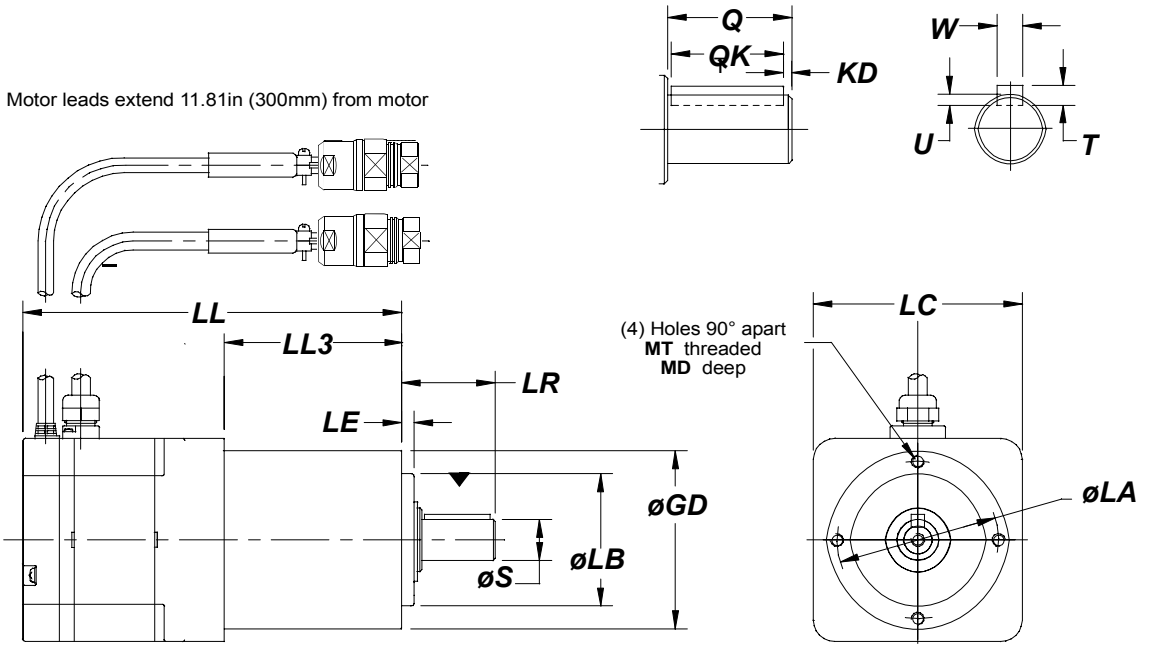


Gearmotor Mechanical Ratings

GEARMOTOR Part Number	Gearhead Backlash (arc min)	Gearhead Maximum Radial Load (lb_f)	Gearhead Maximum Axial Load (lb_f)	Gearhead Inertia ($in \cdot lb \cdot s^2$)	Gearmotor Weight (lb)
SG05SA-PE01□□	<10	146	158	0.000052	3.24
SG10SA-PE01□□					
SG25SA-PE01□□		326	349	0.00025	6.39
SG50SA-PE01□□					
SG1ASA-PE01□□		540	428	0.0016	12.79
SG05SA-PE02□□	<10	326	349	0.00025	7.28
SG10SA-PE02□□					
SG25SA-PE02□□					7.94
SG50SA-PE02□□		540	428	0.0016	14.34
SG1ASA-PE02□□		1035	900	0.0049	27.79
SG05SA-PE04□□	<10	326	349	0.00025	8.82
SG10SA-PE04□□					
SG25SA-PE04□□		540	428	0.0016	15.88
SG50SA-PE04□□		1035	900	0.0049	29.33
SG1ASA-PE04□□		1687	1350	0.0047	50.83
SG05SA-PE08□□	<10	540	428	0.0016	19.18
SG10SA-PE08□□					
SG25SA-PE08□□		1035	900	0.0049	34.84
SG50SA-PE08□□		1687	1350	0.0047	56.34
SG05SA-PE15□□	<10	1035	900	0.0048	34.40
SG10SA-PE15□□					
SG25SA-PE15□□		1687	1350	0.0047	60.75
SG50SA-PE15□□					



Dimensions in inches (mm)



GEARMOTOR	LL3	LL	LE	LR	LB	GD	S	LC	LA	MT	MD	Q	QK	KD	W	T	U
SG05SA-PE01☐A	1.988 (50)	5.177 (131.5)	0.158 (4)	0.965 (24.5)	1.378 (35)	1.969 (50)	0.472 (12)	2.362 (60)	1.732 (44)	M4 x 0.7	0.315 (8)	0.709 (18)	0.551 (14)	0.079 (2)	0.158 (4)	0.158 (4)	0.098 (2.5)
SG10SA-PE01☐A																	
SG25SA-PE01☐A	3.465 (88)	6.858 (174.2)	0.197 (5)	1.417 (36)	2.047 (52)	2.756 (70)	0.630 (16)	2.756 (70)	2.441 (62)	M5 x 0.8	0.394 (10)	1.102 (28)	0.984 (25)		0.197 (5)	0.197 (5)	0.118 (3)
SG50SA-PE01☐A																	
SG1ASA-PE01☐A	4.193 (106.5)	7.500 (190.5)		1.811 (46)	2.677 (68)	3.543 (90)	0.866 (22)	3.543 (90)	3.150 (80)	M6 x 1.0	0.472 (12)	1.417 (36)	1.260 (32)		0.236 (6)	0.236 (6)	0.138 (3.5)
SG05SA-PE02☐A	2.677 (68)	6.181 (157)		1.417 (36)	2.047 (52)	2.756 (70)	0.630 (16)	3.150 (80)	2.441 (62)	M5 x 0.8	0.394 (10)	1.102 (28)	0.984 (25)		0.197 (5)	0.197 (5)	0.118 (3)
SG10SA-PE02☐A																	
SG25SA-PE02☐A	3.465 (88)	6.969 (177)															
SG50SA-PE02☐A	4.193 (106.5)	7.697 (195.5)		1.811 (46)	2.677 (68)	3.543 (90)	0.866 (22)	3.543 (90)	3.150 (80)	M6 x 1.0	0.472 (12)	1.417 (36)	1.260 (32)		0.236 (6)	0.236 (6)	0.138 (3.5)
SG1ASA-PE02☐A	5.295 (134.5)	9.036 (229.5)	0.236 (6)	2.756 (70)	3.543 (90)	4.724 (120)	1.260 (32)	4.724 (120)	4.252 (108)	M8 x 1.25	0.630 (16)	2.284 (58)	1.969 (50)	0.158 (4)	0.394 (10)	0.315 (8)	0.197 (5)
SG05SA-PE04☐A	2.677 (68)	6.969 (177)	0.197 (5)	1.417 (36)	2.047 (52)	2.756 (70)	0.630 (16)	3.150 (80)	2.441 (62)	M5 x 0.8	0.394 (10)	1.102 (28)	0.984 (25)	0.079 (2)	0.197 (5)	0.197 (5)	0.118 (3)
SG10SA-PE04☐A																	
SG25SA-PE04☐A	4.193 (106.5)	8.484 (215.5)		1.811 (46)	2.677 (68)	3.543 (90)	0.866 (22)	3.543 (90)	3.150 (80)	M6 x 1.0	0.472 (12)	1.417 (36)	1.260 (32)		0.236 (6)	0.236 (6)	0.138 (3.5)
SG50SA-PE04☐A	5.295 (134.5)	9.823 (249.5)	0.236 (6)	2.756 (70)	3.543 (90)	4.724 (120)	1.260 (32)	4.724 (120)	4.252 (108)	M8 x 1.25	0.630 (16)	2.284 (58)	1.969 (50)	0.158 (4)	0.394 (10)	0.315 (8)	0.197 (5)
SG1ASA-PE04☐A	6.024 (153)	10.551 (268.0)	0.315 (8)	3.819 (97)	4.724 (120)	6.102 (155)	1.575 (40)		5.512 (140)	M10 x 1.5	0.787 (20)	3.228 (82)	2.756 (70)	0.236 (6)	0.472 (12)		
SG05SA-PE08☐A	3.150 (80)	7.815 (198.5)	0.197 (5)	1.811 (46)	2.677 (68)	3.543 (90)	0.866 (22)		3.150 (80)	M6 x 1.0	0.472 (12)	1.417 (36)	1.260 (32)	0.079 (2)	0.236 (6)	0.236 (6)	0.138 (3.5)
SG10SA-PE08☐A																	
SG25SA-PE08☐A	5.295 (134.5)	9.803 (249)	0.236 (6)	2.756 (70)	3.543 (90)	4.724 (120)	1.260 (32)	4.724 (120)	4.252 (108)	M8 x 1.25	0.630 (16)	2.284 (58)	1.969 (50)	0.158 (4)	0.394 (10)	0.315 (8)	0.197 (5)
SG50SA-PE08☐A	6.024 (153)	10.532(267.5)	0.315 (8)	3.819 (97)	4.724 (120)	6.102 (155)	1.575 (40)		5.512 (140)	M10 x 1.5	0.787 (20)	3.228 (82)	2.756 (70)	0.236 (6)	0.472 (12)		
SG05SA-PE15☐A	4.016 (102)	9.626 (244.5)	0.236 (6)	2.756 (70)	3.543 (90)	4.724 (120)	1.260 (32)		4.252 (108)	M8 x 1.25	0.630 (16)	2.284 (58)	1.969 (50)	0.158 (4)	0.394 (10)		
SG10SA-PE15☐A																	
SG25SA-PE15☐A	6.024 (153)	11.634 (295.5)	0.315 (8)	3.819 (97)	4.724 (120)	6.012 (155)	1.575 (40)		5.512 (140)	M10 x 1.5	0.787 (20)	3.228 (82)	2.756 (70)	0.236 (6)	0.472 (12)		
SG50SA-PE15☐A																	

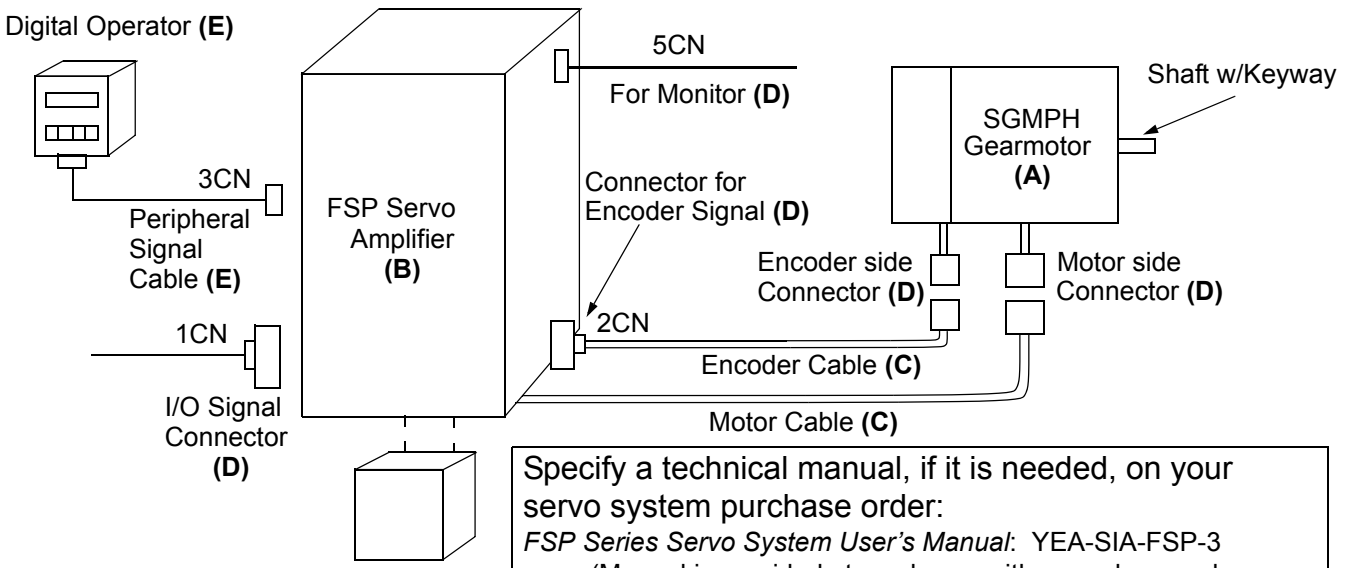
Tolerances for Standard (SG) Gearmotors

Dimension	ΦS		ΦLB		W	
Unit	Diameter	Tolerance	Diameter	Tolerance	Width	Tolerance
in	0.472, 0.630	+0.00047 +0.00004	1.378	+0.00000 -0.00063	0.158, 0.197, 0.236	+0.00000 -0.00118
	0.866	+0.00059 +0.00008	2.047, 2.677	+0.00000 -0.00075	0.39370	+0.00000 -0.00142
	1.25984, 1.57480	+0.00071 +0.00008	3.5433, 4.724	+0.00000 -0.00087	0.47244	+0.00000 -0.00169
mm	12, 26	+0.012 +0.001	35	+0.000 -0.016	4, 5, 6	+0.000 -0.030
	22	+0.015 +0.002	52, 68	+0.000 -0.019	10	+0.000 -0.036
	32, 40	+0.018 +0.002	90, 120	+0.000 -0.022	12	+0.000 -0.043

Selecting: SGMPH Gearmotor System

First, select the Sigma II servomotor suited for your application using SigmaSize: the Yaskawa servomotor sizing software, available at www.yaskawa.com. (You may also request SigmaSize software via e-mail, at: literature@yaskawa.com).
Use the diagram below to locate and identify the components of your system. Each item is letter-coded and cross-referenced in the option tables on the following pages.

System Configuration



Specify a technical manual, if it is needed, on your servo system purchase order:
FSP Series Servo System User's Manual: YEA-SIA-FSP-3
(Manual is provided at no charge with a purchase order, but it must be requested).

Model Number Designation

SG 05 S A-PE 02 A A C

Sigma II Gearmotor Series
- G: Standard (<10 arc min)

Reduction Ratio
- 05: 5:1
- 10: 10:1
- 25: 25:1
- 50: 50:1
- 1A: 100:1

Construction
- S: Standard

Revision Level

Motor Series
- PE: SGMPH

Motor Output
- 01: 100W (0.13hp)
- 02: 200W (0.25hp)
- 04: 400W (0.5hp)
- 08: 750W (1hp)
- 15: 1.5kW (2hp)

Power Supply
- A: 200V
- B: 100V

Encoder Specifications
- A: 13-Bit Incremental Encoder
- 1: 16-Bit Absolute Encoder

Accessories
- C: $24V_{DC}$ Brake
- Blank: Standard YEA stock motor options

Gearmotor & Amplifier Selection

Use the table below to select the appropriate SGMPH Sigma II gearmotor and amplifier.
(Refer to the motor model # designation on the previous page specifying the available modification to motor construction/features.)

Gearmotor **(A)**					Gearhead only		Amplifier MODEL # **(B)*** FSP-	Gear Motor Item Class	Amplifier Item Class
MODEL #	Rated Torque (in • lb)	Peak Torque (in • lb)	Rated Speed (rpm)	Maximum Speed (rpm)	Inertia (in • lb • s^2)	Gear Ratio			
SG05SA-PE01AA	13.67	40.93	600	1000	0.000052	5:1	01AMC	Normal leadtime 3 - 4 weeks for assembly	Stock
SG10SA-PE01AA	27.34	81.84	300	500		10:1			
SG25SA-PE01AA	66.95	200.39	120	200	0.00025	25:1			
SG50SA-PE01AA	133.89	283.00	60	100		50:1			
SG1ASA-PE01AA	267.78	637.00	30	50	0.0016	100:1			
SG05SA-PE02AA	27.34	81.84	600	1000	0.00025	5:1	02AMC		
SG10SA-PE02AA	54.68	163.69	300	500		10:1			
SG25SA-PE02AA	133.89	283.00	120	200		25:1			
SG50SA-PE02AA	267.78	708.00	60	100	0.0016	50:1			
SG1ASA-PE02AA	535.56	1593.00	26	48	0.0049	100:1			
SG05SA-PE04AA	54.81	164.42	600	1000	0.00025	5:1	04AMC		
SG10SA-PE04AA	109.61	283.00	300	500		10:1			
SG25SA-PE04AA	268.38	708.00	120	200	0.0016	25:1			
SG50SA-PE04AA	536.75	1610.25	52	96		50:1			
SG1ASA-PE04AA	1073.50	2832.00	20	36	0.0047	100:1			
SG05SA-PE08AA	102.34	306.04	600	1000	0.0016	5:1	08AMC		
SG10SA-PE08AA	204.67	612.07	300	500		10:1			
SG25SA-PE08AA	501.13	1498.63	104	192	0.0049	25:1			
SG50SA-PE08AA	1002.25	2997.25	40	72	0.0047	50:1			
SG05SA-PE15AA	205.16	614.50	520	960	0.0048	5:1	15AMC		
SG10SA-PE15AA	410.31	1228.99	260	480		10:1			
SG25SA-PE15AA	1004.63	3009.13	80	144	0.0047	25:1			
SG50SA-PE15AA	2009.25	3540.00	40	72	0.0047	50:1			
SG05SA-PE01BA	13.67	40.93	600	1000	0.000052	5:1	01BMC		
SG10SA-PE01BA	27.34	81.84	300	500		10:1			
SG25SA-PE01BA	66.95	200.39	120	200	0.00025	25:1			
SG50SA-PE01BA	133.89	283.00	60	100		50:1			
SG1ASA-PE01BA	267.78	637.00	30	50	0.0016	100:1			
SG05SA-PE02BA	27.34	81.84	600	1000	0.00025	5:1	02BMC		
SG10SA-PE02BA	54.68	163.69	300	500		10:1			
SG25SA-PE02BA	133.89	283.00	120	200		25:1			
SG50SA-PE02BA	267.78	708.00	60	100	0.0016	50:1			
SG1ASA-PE02BA	535.56	1593.00	26	48	0.0049	100:1			

Notes: $24V_{DC}$ Brakes for SGMPH Sigma II gearmotors are standard. Contact a local source for $24V_{DC}$ power supplies.
Use the tables on the following page to specify mating connectors or pre-wired cables in different lengths.
* For more detailed 100/200V FSP amplifier specifications and dimensions, refer to pages 91 - 101.

Pre-wired Cable Selection

Use the table below to select pre-wired cables for your SGMPH Sigma II gearmotor.

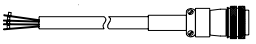
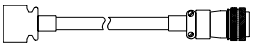
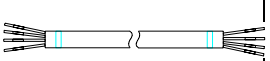
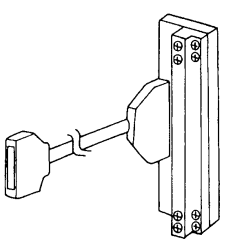
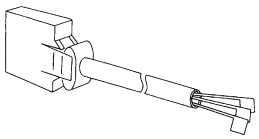
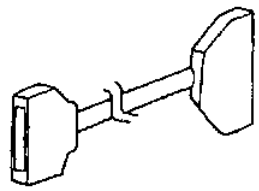
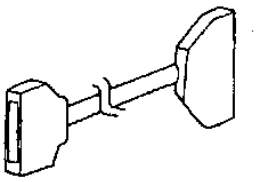
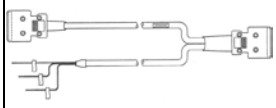
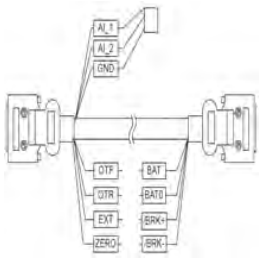
Cable Description **(C)**		Motor Size (kW)	Part Number*	Comments	Item Class
Power Cable with Interconnectron Connectors (without Brake)		0.1, 0.2, 0.4, 0.8	B4ICE-□□(A)	These UL and CE compliant cables are available in five lengths.Use the following key to specify needed cable length (last two digits of the part number): 03: 3m 05: 5m 10: 10m (standard) 15: 15m 20: 20m	Stock**
		1.5	B5ICE-□□(A)		
Power Cable with Interconnectron Connectors (with Brake)		0.1, 0.2, 0.4, 0.8	B4IBCE-□□(A)		
		1.5	B5IBCE-□□(A)		
Encoder Cable with Interconnectron Connector (incremental or absolute) (IP67)		All	AFPHCE-□□(A)		
Encoder feedback adapter cable for incremental and absolute****	–		AFAD-P2(A)	Connects these full length encoder feedback cables to the FSP amplifier (Encoder feedback cables for SGDH amp) JZSP-CMP00-XX(A) A1ICE-XX(A) JZSP-CMP02-XX(B) 0.2 meter length	Stock
Encoder feedback adapter cable for absolute encoders. Cable has built in absolute encoder battery and case.	–		AFADABS-P2(A)	Connects these full length encoder feedback cables to the FSP amplifier (Encoder feedback cables for SGDH amp) JZSP-CMP00-XX(A) A1ICE-XX(A) JZSP-CMP02-XX(B) Built-in battery is: JZSP-BA01 0.2 meter length	
Encoder Cable (for applications up to 20m) Only for Solder Connections			FR-RMCT-SB	These cables are available in any length. For example, to order one FR-RMCT-SB cable, 16m long, specify: quantity: 16 part no.: FR-RMCT-SB	
Encoder Cable (for applications from >20 to <50m) Only for Solder Connections			UL20276-SB		
Input/Output 1CN Cable & Transition Terminal Block			JUSP-TA50P	35mm DIN rail mountable; the cable length is 0.5 meters.	
			JUSP–WA50P–□□	35mm DIN Rail mountable D50: 0.5 meters (standard) 01: 1 meter (standard) 02: 2 meters 03: 3 meters	

Table continued on next page.

Cable Description **(C)**		Motor Size (kW)	Part Number*	Comments	Item Class
Input/Output 1CN Cable with Pigtail Leads		All	JZSP-CKI01-□(A)	Use the following key to specify required cable length (last digit of part number): 1: 1m (standard) 2: 2m 3: 3m	
Input/Output 1CN Cable Cable with Female D-Sub output Connector***			JZSP-CKI0D-□□	Use the following key to specify required cable length (last two digits of the part number): D50: 0.5m 01: 1m (standard) 02: 2m 03: 3m	Stock**
Input/Output 1CN SMC4000 to FSP Interface Cable			SMCCBL2□□	Use the following key to determine the desired length specification. □□= 02: 2 Feet 05: 5 Feet 10: 10 Feet 15: 15 Feet	
Input/Output 1CN SMC4000 to FSP Interface Cable with prepared alarm and reset inputs. requires jumper in SMC4000			SMCCBLH□□		
Input/Output 1CN SMC4000 to FSP Interface Cable with flying leads for additional amplifier I/O			SMCCBLB□□		Limited Stock
Input/Output 1CN MP2000 series controller to FSP Interface Cable			JEPMC–W2040–□□	Use the following key to determine the desired length specification. □□= A5: 0.5 meters 01: 1 meter 03: 3 meters	

* The "(A)" at the end of the cable part number indicates the revision level. Revision level may be subject to change prior to this catalog reprinting.

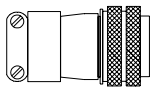
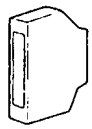
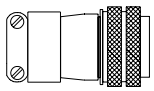
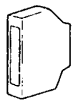
** Standard cable lengths are Stock items; non-standard cable lengths are Limited Stock items.

*** 50 Pin Female D-Sub output connector mates to customer supplied third party terminal block. (e.g., Wago #289-449, Weidmuller #919658, Phoenix #2283647, Amphenol/Sine #20-51039, and many others)

**** For systems using the absolute encoder and this part number, the absolute encoder battery must be connected at the amplifier 1CN connector.

Connector Selection

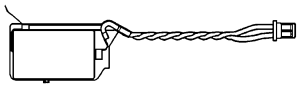
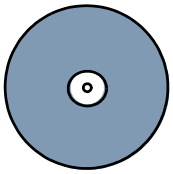
Use the table below to select mating connectors or kits for your SGMPH Sigma II gearmotor.

Connector Description **(D)**		Motor Size (kW)	Part Number	Comments	Item Class
Interconnectron Connector for Motor Power Cable (with or without Brake)		0.1, 0.2, 0.4, 0.8, 1.5	FIN07S-B2	IP67 Mated Solder Cup	Stock
2CN Amplifier Mating Connector			DE9406973*	—	
Interconnectron Connector for Encoder Cable (incremental or absolute encoder)			FIN17C-A2	IP67 Mated Gauge: 24 - 18 AWG Requires Crimp Tool B150 and positioner.	
1CN Amplifier Mating Connector		All	JZSP-CKI9	—	
Interconnectron Crimp Tool	—		B150	—	Limited Stock
Positioner	—		B055/A	—	
3CN Peripheral Mating Connector	—		YSC-1	—	Stock
5CN Connector and 1m Cable with Pigtails	—		DE9404559	Can use 5CN for analog speed and torque monitor service checks.	

*Alternative Part # is DTCR6973.

Peripheral Device Selection

Use the table below to select peripheral devices for your SGMPH Sigma II gearmotor.

Component	Description **(E)**	Part Number	Comments	Item Class
Software Interface Cable	—	YS-12	Pre-wired 2.0m cable with 9-pin connector	Stock
Absolute Encoder Battery		JZSP-BA01-1	3.6V, 1000mAh (lithium battery) with 5cm leads for wiring to 1CN	
		JZSP-BA01	3.6V, 1000mAh (Lithium Battery) replacement battery for use in absolute adapter cable AFADABS-P2(A)	
Flexworks		FSPGUI1 or download at www.yaskawa.com	–	
Individual External Regenerative Unit	For: FSP-01AMC FSP-02AMC FSP-04AMC FSP-08AMC-S	RH12050ohmJ	These are general purpose regenerative units.* **Caution:** Proper set-up is necessary to avoid equipment damage.	
	For: FSP-15AMC-S	RH500N25_ohmK		
DC Reactor (for suppressing harmonics in the power supply)	For 200V: FSP-01AMC FSP-02AMC FSP-04AMC FSP-08AMC-S FSP-15AMC-S	X5071 X5070 X5069 X5079 X5078	—	Limited Stock
	For 100V: FSP-01BMC FSP-02BMC	X5063 X5062		

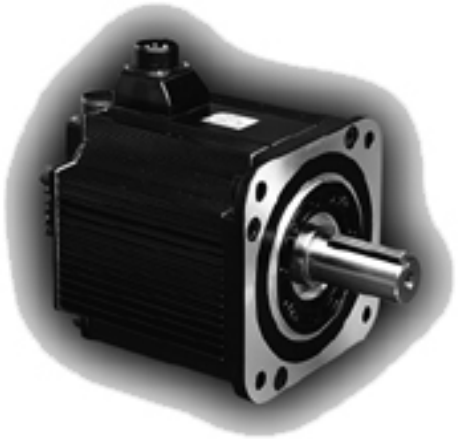
* Specify the individual resistor part number RH500N25_OHMK in necessary series or parallel connection. Refer to the FSP servo amplifier section of this catalog (page 103) for additional specifications, and the *FSP Series Servo System User's Manual* (YEA-SIA-FSP-3) for proper resistor sizing guidelines.

NOTES:

General Purpose

SGMGH Servomotors - With Incremental / Absolute Encoder

Rated Output: 0.45kW, 0.85kW,
1.3kW, 1.8kW, 2.9kW



For Additional Information	Page(s)
SGMGH Ratings & Specifications	54
SGMGH Speed/Torque Curves	55
SGMGH Dimensions	56 - 57
SGMGH Selection/Ordering Information	58 - 64
FSP Ratings & Specifications	91 - 97
FSP Dimensions	98 - 104

Design Features

1. **Compact**
   - Small sized motor
     Compatible with previous generation G series motors
     Five types of rated outputs ranging from 79 to 400in • lb of peak torque
     Optional built-in holding brake available
2. **Higher Speed and acceleration**
   - Up to 3000rpm maximum
   - High torque to inertia ratio
3. **Encoders**
   - 17-bit (32,768 ppr x 4) incremental encoder (standard)
   - 17-bit absolute encoder (optional)
4. **Enhanced Environmental Resistance**
   - Totally enclosed, self-cooled IP67 (excluding shaft)
   - Shaft seal (optional)
5. **Application Emphasis**
   - Machine tools and woodworking machines
   - Packaging machines
   - Gantry Robots
   - Press Automation
   - Thermoforming
6. **Certified International Standards**
   - UL, cUL recognized (File #: E165827) CE compliance

Servomotor Ratings and Specifications

Time Rating: Continuous
Insulation: Class F
Vibration: 15μm or less
Withstand Voltage: $1500V_{ac}$
Insulation Resistance: $10M\Omega$ minimum at $500V_{DC}$

Enclosure: Totally-enclosed, self-cooled IP67 (except for shaft opening)
Ambient Temperature: 0 to 40ºC
Ambient Humidity: 20 to 80% (non-condensing)
Rated Speed*: 1500rpm

Maximum Rotational Speed*:
0.45 to 7.5kW: 3000rpm
11 and 15kW: 2000rpm
Excitation: Permanent magnet
Drive Method: Direct drive
Mounting: Flange-mounted

* Values when the servomotor is combined with an FSP servo amplifier.

MOTORS: SGMGH-	Rated Output*	Rated Torque*		Instantaneous Peak Torque*		Rated Current*	Instantaneous Maximum Current*
	kW (hp)	N • m	lb_f • in (KG • cm)	N • m	lb_f • in (KG • cm)	A_{rms}	A_{rms}
05A□A	0.45 (0.6)	2.84	25 (29)	8.92	79 (91)	3.8	11
09A□A	0.85(1.1)	5.39	48 (55)	13.8	122 (141)	7.1	17
13A□A	1.3 (1.7)	8.34	74 (85)	23.3	207 (238)	10.7	28
20A□A	1.8 (2.4)	11.5	102 (117)	28.7	254 (293)	16.7	42
30A□A	2.9 (3.9)	18.6	165 (190)	45.1	404 (460)	23.8	56

* Values when the servomotor is combined with an FSP servo amplifier.

MOTORS SGMGH-	Torque Constant	Moment of Inertia		Holding Brake (at 20°C)					Allowable Load Inertia	Rated Power Rate*	Rated Angular Acceleration*	Inertia Time Constant	Inductive Time Constant
				Capacity	Torque	Coil. Resistance	Rated Current	Additional Inertia					
	$\frac{lb_f \cdot in}{A_{rms}}$ $(\frac{N \cdot m}{A_{rms}})$	$lb \cdot in \cdot s^2 \times 10^{-3}$	$KG \cdot m^2 \times 10^{-4}$	W	N • m	Ω	A	$lb \cdot in \cdot s^2 \times 10^{-3}$	$KG \cdot m^2 \times 10^{-4}$	kW/s	rad/s^2	ms	ms
05A□A	7.26 (0.82)	6.41	7.24	9.85	4.41	58.7	0.41	1.85	36.2	11.2	3930	5.0	5.1
09A□A	7.35 (0.83)	12.3	13.9		12.7				69.5	20.9	3880	3.1	5.3
13A□A	7.43 (0.84)	18.2	20.5						103	33.8	4060	2.8	6.3
20A□A	6.46 (0.73)	28.1	31.7	18.5	43.1	31.1	0.77	7.75	159	41.5	3620	2.2	12.8
30A□A	7.35 (0.83)	40.7	46.0						230	75.3	4050	1.9	12.5

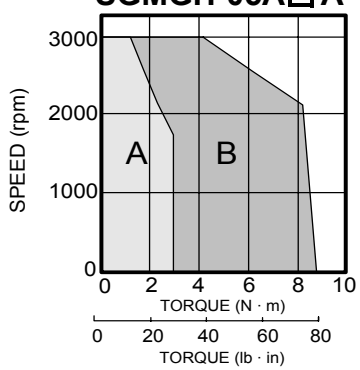
* Values when the servomotor is combined with an FSP servo amplifier at an armature winding temperature of 20°C.

** These characteristics can be obtained when the following heat sinks (steel plates) are used for cooling purposes:
Type 05A□A to 13A□A: $15.75 \times 15.75 \times 0.79$ (in) ($400 \times 400 \times 20$ (mm))
Type 20A□A to 30A□A: $21.65 \times 21.65 \times 1.18$ (in) ($550 \times 550 \times 30$ (mm))

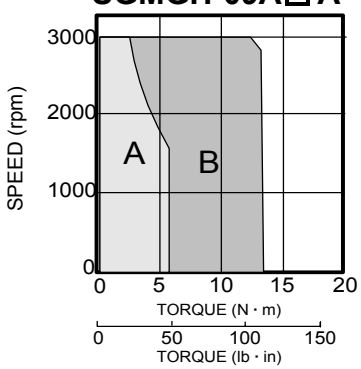
Speed / Torque Curves

200V

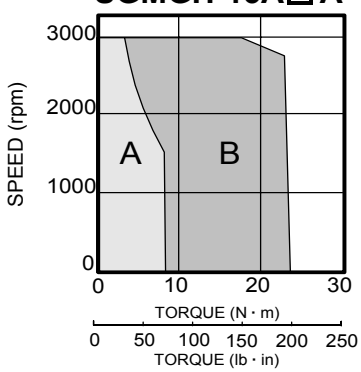
SGMGH-05A□A



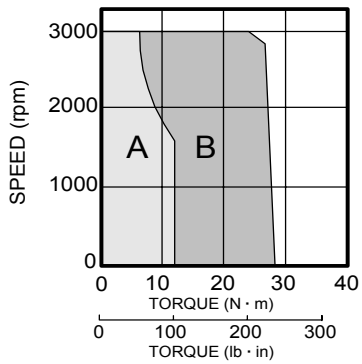
SGMGH-09A□A



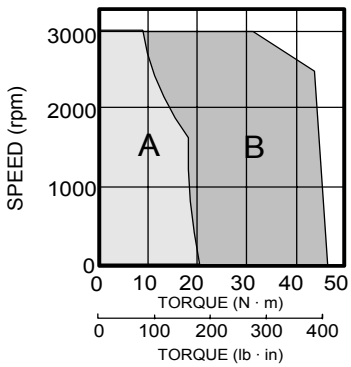
SGMGH-13A□A



SGMGH-20A□A



SGMGH-30A□A

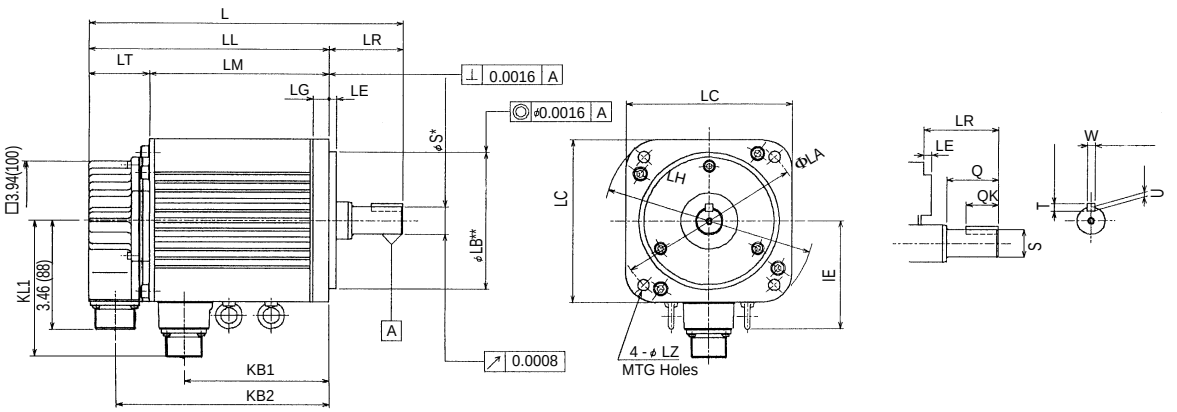


A : CONTINUOUS DUTY ZONE

B : INTERMITTENT DUTY ZONE

Dimensions in inches (mm)

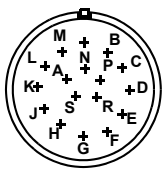
(1) 17-Bit Incremental/Absolute Encoder



Type SGMGH-	L	LL	LM	LR	LT	KB1	KB2	IE	KL1	Flange Dimensions							Shaft End Dimension						Approximate Mass lb$_f$ (kg)	Allowable Radial Load lb$_f$ (N)	Allowable Thrust Load lb$_f$ (N)
										FLA	FLB**	LC	LE	LG	FLH	FLZ	FS*	Q	QK	W	T	U			
05A□A61	7.72 (196)	5.43 (138)	3.62 (92)	2.28 (58)	1.81 (46)	2.56 (65)	4.61 (117)	—	4.29 (109)	5.71 (145)	4.33 (110)	5.12 (130)	0.24 (6)	0.47 (12)	6.5 (165)	0.35 (9)	0.75 (19)	1.57 (40)	0.98 (25)	0.20 (5)	0.20 (5)	0.12 (3)	12.1 (5.5)	110 (490)	22 (98)
09A□A61	8.62 (219)	6.34 (161)	4.53 (115)			3.46 (88)	5.51 (140)																16.8 (7.6)		
13A□A61	9.57 (243)	7.28 (185)	5.47 (139)			4.41 (112)	6.46 (164)										0.87 (22)			0.24 (6)	0.24 (6)	0.14 (3.5)	21.2 (9.6)	154 (686)	77 (343)
20A□A61	9.65 (245)	6.54 (166)	4.69 (119)	3.11 (79)	1.85 (47)	3.5 (89)	5.71 (145)		5.51 (140)	7.87 (200)	4.5 (114.3)	7.09 (180)	0.13 (3.2)	0.71 (18)	9.06 (230)	0.53 (13.5)	1.38 (35)	2.99 (76)	2.36 (60)	0.39 (10)	0.31 (8)	0.20 (5)	30.9 (14)	265 (1176)	110 (490)
30A□A61	10.67 (271)	7.56 (192)	5.71 (145)			4.53 (115)	6.73 (171)																39.7 (18)	331 (1470)	

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.7480, 0.8661	+0.0000-0.0005	4.3307	+0.0000 -0.0014
	1.3780	+0.0004-0.0000	4.5000	+0.0000 -0.0010
	1.6535	+0.0000 -0.0006		
	2.1700	+0.0012+0.0004	7.8700	+0.0000 -0.0018
mm	19.000, 22.000	+0.000 -0.013	110.000	+0.000 -0.035
	35.000	+0.010 -0.000	114.300	+0.000 -0.025
	42.000	+0.000 -0.016		
	55.000	+0.030 +0.011	200.000	+0.0000 -0.046

Encoder Plug

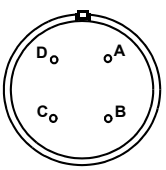


MS3102A20-29P

Connector Wiring on the Encoders			
A	—	K	—
B	—	L	—
C	Data +	M	—
D	Data -	N	—
E	—	P	—
F	—	R	—
G	0V	S	Battery - (Note*)
H	+5V$_{dc}$	T	Battery + (Note*)
J	FG (Frame Ground)	*Note: Used with an absolute encoder only.	

Non-Environmental Mating Connector:
MS3108B20-29S (L Type)
MS3106B20-29S (Straight Type)
Cable Clamp: MS3057-12A

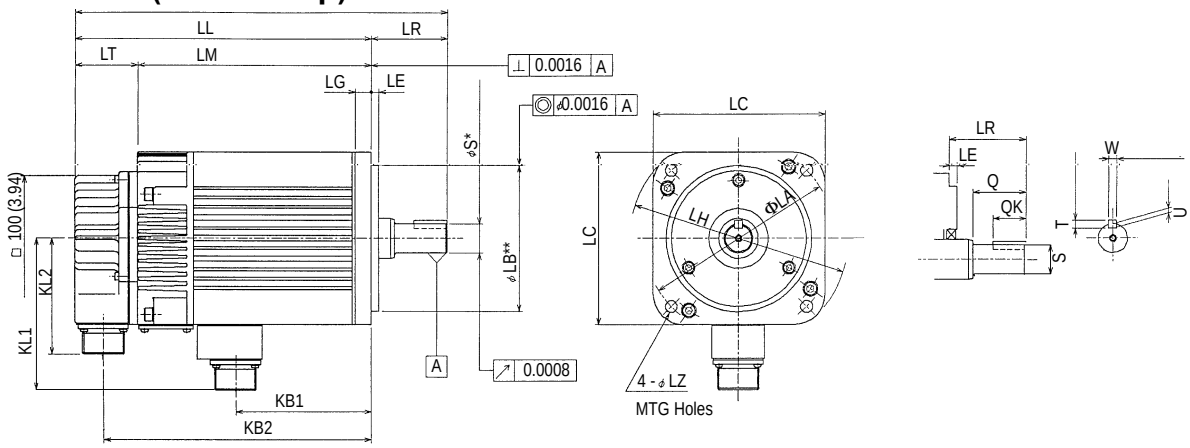
Motor Plug



Connector Wiring on the Motor Side	
A	U Phase
B	V Phase
C	W Phase
D	Ground Terminal

(2) 17-Bit Incremental/Absolute Encoder, with Brake

- **0.5 to 3.0kW (0.7 to 2.9hp)**

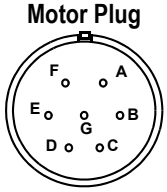


Type SGMGH-	L	LL	LM	LR	LT	KB1	KB2	KL1	KL2	Flange Dimensions							Shaft End Dimension						Approximate Mass lb$_f$ (kg)	Allowable Radial Load lb$_f$ (N)	Allowable Thrust Load lb$_f$ (N)
										ΦLA	ΦLB**	LC	LE	LG	ΦLH	ΦLZ	ΦS*	Q	QK	W	T	U			
05A□A6C	9.21 (234)	6.93 (176)	5.08 (129)	2.28 (58)	1.85 (47)	2.2 (56)	6.1 (155)	4.72 (120)	3.46 (88)	5.71 (145)	4.33 (110)	5.12 (130)	0.24 (6)	0.47 (12)	6.5 (165)	0.35 (9)	0.75 (19)	1.57 (40)	0.98 (25)	0.20 (5)	0.20 (5)	0.12 (3)	16.5 (7.5)	110 (490)	22 (98)
09A□A6C	10.12 (257)	7.83 (199)	5.98 (152)			3.11 (79)	7.01 (178)																21.2 (9.6)		
13A□A6C	11.06 (281)	8.78 (223)	6.93 (176)			4.06 (103)	7.95 (202)										0.87 (22)			0.24 (6)	0.24 (6)	0.14 (3.5)	26.5 (12)	154 686)	77 (343)
20A□A6C	11.65 (296)	8.54 (217)	6.69 (170)	3.11 (79)		3.11 (79)	7.72 (196)	5.75 (146)		7.87 (200)	4.5 (114.3)	7.09 (180)	0.13 (3.2)	0.71 (18)	9.06 (230)	0.53 (13.5)	1.38 (35)	2.99 (76)	2.36 (60)	0.39 (10)	0.31 (8)	0.20 (5)	41.9 (19)	265 (1176)	110 (490)
30A□A6C	12.68 (322)	9.57 (243)	7.72 (196)			4.13 (105)	8.74 (222)																51.8 (23.5)	331 (1470)	

Note: 1. Dimensions are the same when using either incremental or absolute encoders (with or without optional shaft seal).
2. Tolerances on the dimensions of flange type LB and of shaft extensions S are based on JIS (Japanese Industrial Standard) B0401 "Limits and Fits for Engineering."

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.7480, 0.8661	+0.0000- 0.0005	4.3307	+0.0000 -0.0014
	1.3780	+0.0004- 0.0000	4.5000	+0.0000 -0.0010
mm	19.000, 22.000	+0.000 -0.013	110.000	+0.000 -0.035
	35.000	+0.010 -0.000	114.300	+0.000 -0.025

Motor Plug

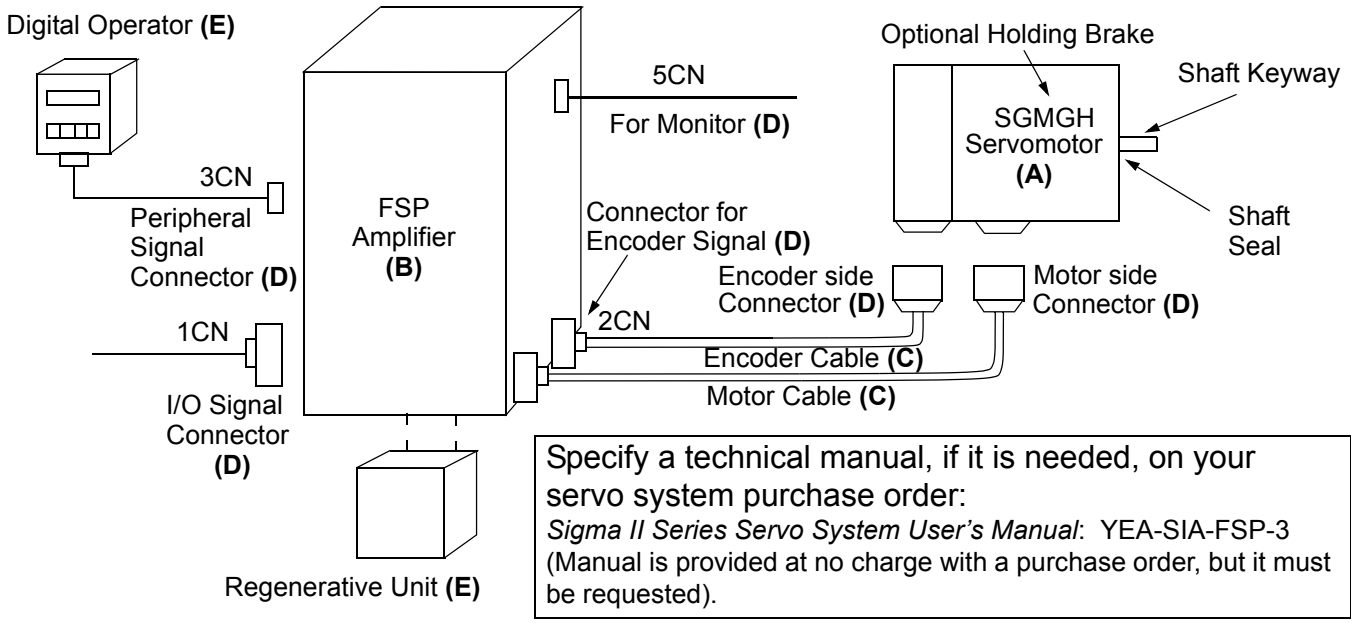


Connector Wiring on the Motor Side			
A	U Phase	E	Brake Terminal
B	V Phase	F	Brake Terminal
C	W Phase	G	—
D	FG (Frame Ground)		

Selecting: SGMGH Sigma II Servo System

First, select the Sigma II servomotor suited for your application using SigmaSize: the Yaskawa servomotor sizing software, available at www.yaskawa.com. (You may also request SigmaSize software via e-mail, at: literature@yaskawa.com).
Use the diagram below to locate and identify the components of your system. Each item is letter-coded and cross-referenced in the option tables on the following pages.

System Configuration



Specify a technical manual, if it is needed, on your servo system purchase order:
Sigma II Series Servo System User's Manual: YEA-SIA-FSP-3
(Manual is provided at no charge with a purchase order, but it must be requested).

Model Number Designation

SGMGH - 09 A C A 6 C

Sigma Servomotor Type

Rated Output *
- 05: 500W (0.7hp)
- 09: 850W (1.14hp)
- 13: 1.3kW (1.7hp)
- 20: 2.0kW (2.7hp)
- 30: 3.0kW (4.0hp)

Power Supply
- A: 200V

Accessories
- 1: Standard
- C: $24V_{DC}$ Brake
- S: Shaft Seal
- E: Brake and Shaft Seal

Shaft Specifications
- 6: Straight Shaft with Keyway

Rated Speed
- A: 1500rpm

Encoder Specifications
- C: 17-Bit Incremental Encoder
- 2: 17-Bit Absolute Encoder

* 4.4kW motor available in 400 volt.

Servomotor & Amplifier Selection

Use the table below to select the appropriate SGMGH Sigma II servomotor and amplifier.
(Refer to the motor model # designation on the previous page specifying the available modification to motor construction/features.)

Description	Peak Torque (in • lb)	Rated Torque (in • lb)	Motor Inertia (in • lb • s^2 x 10^{-3})	Motor MODEL # (A)	Amplifier MODEL # (B)* Analog/Digital Input FSP-	Motor & Amplifier Item Class
200V Three-Phase 17-bit Incremental Encoder Straight Shaft with Keyway 3000rpm maximum MS Connectors	79	25	6.41	SGMGH-05ACA61	08AMC–S	Stock
			8.26	SGMGH-05ACA6C		
	122	48	12.30	SGMGH-09ACA61	10AMC	
			14.15	SGMGH-09ACA6C		
	207	74	18.2	SGMGH-13ACA61	15AMC–S	
			20.1	SGMGH-13ACA6C		
	254	102	28.1	SGMGH-20ACA61	20AMC	
			35.9	SGMGH-20ACA6C		
	404	165	40.7	SGMGH-30ACA61	30AMC	
			48.5	SGMGH-30ACA6C		

Note: $24V_{DC}$ brakes for SGMGH Sigma II servomotors are standard. Contact a local source for $24V_{DC}$ power supplies. For technical information, request Yaskawa manual number YEA-SIA-FSP-3.

* For more detailed FSP amplifier specifications and dimensions, refer to pages 89 to 105.

Pre-wired Cable Selection

Use the table below to select pre-wired cables for your SGMGH Sigma II servomotor.

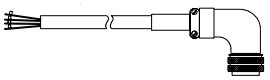
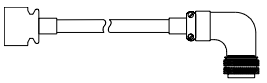
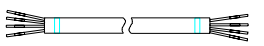
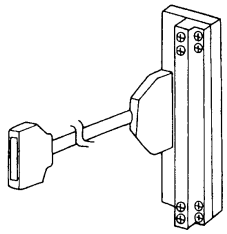
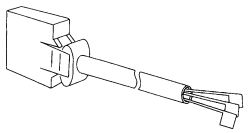
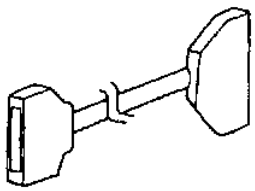
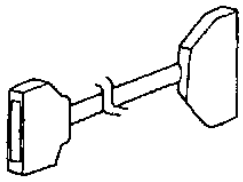
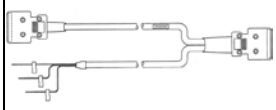
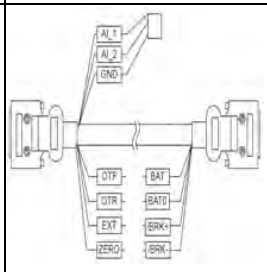
Cable Description (C)		Motor Size (kW)	Part Number*		Comments	Item Class
			without Brake	with Brake		
Power Cable with Connectors (IP67)		0.5, 0.9, 1.3	B1E-□□(A)	B1BE-□□(A)	Use the following key to specify needed cable length (last two digits of the part number): 03: 3m 05: 5m 10: 10m (standard) 15: 15m 20: 20m	Stock***
		2.0, 3.0	B2E-□□(A)	B2BE-□□(A)		
Encoder Cable (incremental or absolute) (IP67)		All	AFGHCE-□□(A)			
Encoder feedback adapter cable for incremental and absolute*****	–		AFAD-P2(A)		Connects these full length encoder feedback cables to the FSP amplifier (Encoder feedback cables for SGDH amp) JZSP-CMP00-XX(A) A1ICE-XX(A) JZSP-CMP02-XX(B) 0.2 meter length	Stock
Encoder feedback adapter cable for absolute encoders. Cable has built in absolute encoder battery and case.	–		AFADABS-P2(A)		Connects these full length encoder feedback cables to the FSP amplifier (Encoder feedback cables for SGDH amp) JZSP-CMP00-XX(A) A1ICE-XX(A) JZSP-CMP02-XX(B) Built-in battery is: JZSP-BA01 0.2 meter length	
Encoder Cable (for applications up to 20m) for solder connections			FR-RMCT-SB		These cables are available in any length. For example, to order one FR-RMCT-SB cable, 16m long, specify: quantity: 16 part no.: FR-RMCT-SB	
Encoder Cable (for applications from >20 to <50m) for solder connections			UL20276-SB			

Table continued on next page.

Cable Description (C)		Motor Size (kW)	Part Number*		Comments	Item Class
			without Brake	with Brake		
Input/Output 1CN Cable & Transition Terminal Block		All	JUSP-TA50P		35mm DIN rail mountable; the cable length is 0.5 meters.	Stock**
			JUSP–WA50P–□□		35mm DIN Rail mountable D50: 0.5 meters (standard) 01: 1 meter (standard) 02: 2 meters 03: 3 meters	
Input/Output 1CN Cable with Pigtail Leads			JZSP-CKI01-□(A)		Use the following key to specify needed cable length (last digit of part number): 1: 1m (standard) 2: 2m 3: 3m	
Input/Output 1CN Cable Cable with Female D-Sub output Connector****			JZSP-CKI0D-□□		Use the following key to specify required cable length (last two digits of the part number): D50: 0.5m 01: 1m (standard) 02: 2m 03: 3m	
Input/Output 1CN SMC4000 to FSP Interface Cable			SMCCBL2□□		Use the following key to determine the desired length specification. □□= 02: 2 Feet 05: 5 Feet 10: 10 Feet 15: 15 Feet	
Input/Output 1CN SMC4000 to FSP Interface Cable with prepared alarm and reset inputs. requires jumper in SMC4000			SMCCBLH□□			
Input/Output 1CN SMC4000 to FSP Interface Cable with flying leads for additional amplifier I/O			SMCCBLB□□			Limited Stock
Input/Output 1CN MP2000 series controller to FSP Interface Cable			JEPMC–W2040–□□		Use the following key to determine the desired length specification. □□= A5: 0.5 meters 01: 1 meter 03: 3 meters	

* "(A)" at the end of the cable number is the revision level. The revision level may be changed prior to this catalog's reprinting.

** When ordering these cables for motors with brakes, order the standard power cable and the additional cable for the brake.

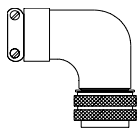
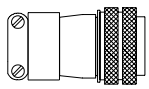
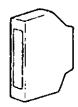
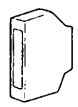
*** Standard cable lengths are Stock items; non-standard cable lengths are Limited Stock items.

**** 50 Pin Female D-Sub output connector mates to customer supplied third party terminal block. (e.g., Wago #289-449, Weidmuller #919658, Phoenix #2283647, Amphenol/Sine #20-51039, and many others).

***** For systems using the absolute encoder and this part number, the absolute encoder battery must be connected at the amplifier 1CN connector.

Connector Selection

Use the table below to select mating connectors for each SGMGH Sigma II servomotor.

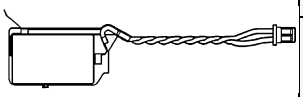
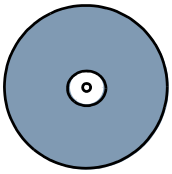
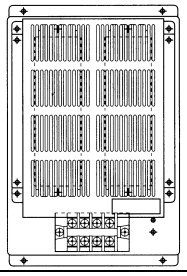
Connector Description (D)		Motor Size (kW)	Part Number		Comments	Item Class
			without Brake	with Brake		
MS Connector for Motor Power Cable*		0.5, 0.9, 1.3	MS3106B18-10S	MS3106B20-15S	Straight-type connector	Stock
			MS3108B18-10S	MS3108B20-15S	L-type connector	
			MS3057-10A	MS3057-12A	Cable clamp	
		2.0, 3.0	MS3106B22-22S	MS3106B24-10S	Straight-type connector	
			MS3108B22-22S	MS3108B24-10S	L-type connector	
			MS3057-12A	MS3057-16A	Cable clamp	
MS Connector for Encoder Cable (incremental or absolute encoder)		All	MS3106B20-29S		Straight-type connector	
			MS3108B20-29S		L-type connector	
			MS3057-12A		Cable clamp	
1CN Mating Connector			JZSP-CKI9		—	
2CN Encoder Mating Connector			DE9406973**		—	
3CN Peripheral Mating Connector	—		YSC-1		—	
5CN Connector and 1m Cable with Pigtails	—		DE9404559		Can use 5CN for analog speed and torque monitor service checks	

* Choose either a straight or L-type connector and the associated cable clamp for a complete assembly. For example, L-type connector MS3108B18-10S is compatible with cable clamp MS3057-10A. MS connectors listed in the table are non-environmental.

** Alternate part number: DTCR6973

Peripheral Device Selection

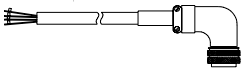
Use the table below to select peripheral devices for each SGMGH Sigma II servomotor.

Component (E)		Part Number	Description	Item Class
Software Interface Cable	—	YS-12	Pre-wired 2.0m cable with 9-pin connector	Stock
Absolute Encoder Battery		JZSP-BA01-1	3.6V, 1000mAh (lithium battery) with 5cm leads for wiring to 1CN	
		JZSP-BA01	3.6V, 1000mAh (Lithium Battery) replacement battery for use in absolute adapter cable AFADABS-P2(A)	
Flexworks		FSPGUI1 or download at www.yaskawa.com	–	
External Regenerative Unit (Optional)		JUSP-RA04	These are general purpose regenerative units.* Order the Motion document: PI#99004 for setup instructions for this unit. **Caution:** Proper setup is necessary to avoid equipment damage.	
DC Reactor (for suppressing harmonics in the power supply)	For 200V: FSP-08AMC–S FSP-10AMC	X5079 X5061	—	Limited Stock
	FSP-15AMC-S FSP-20AMC	X5060		
	FSP-30AMC	X5059		

* For an alternate solution, specify the individual resistor part number RH500N25_OHMK in necessary series or parallel connection. Refer to the FSP servo amplifier section of this catalog for additional specifications, and the *FSP Series Servo System User's Manual* (YEA-SIA-FSP-3) for proper resistor sizing guidelines.

CE Pre-wired Cable Selection

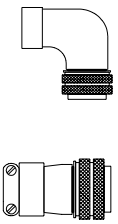
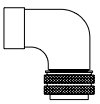
Use the table below to select shielded pre-wired power cables for your SGMGH Sigma II servomotor.

Cable Description (C)		Motor Size (kW)	Part Number*		Comments	Item Class
			without Brake	with Brake		
Power Cable with Connectors IP67		0.5, 0.9, 1.3	B1CE-□□(A)	B1BCE-□□(A)	Use the following key to specify needed cable length (last two digits of the part number): 03: 3m 05: 5m 10: 10m (standard) 15: 15m 20: 20m	Limited Stock
		2.0, 3.0	B2CE-□□(A)	B3BCE-□□(A)		

* "(A)" at the end of the cable number is the revision level, which may be changed prior to this catalog's reprinting.

CE Connector Selection

Use the table below to select mating connectors for your SGMGH Sigma II servomotor.

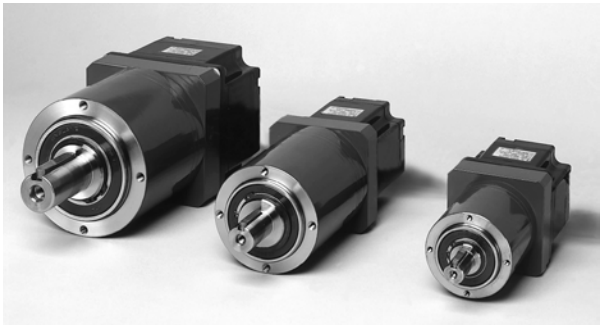
Connector Description (D)		Motor Size (kW)	Part Number		Comments**	Item Class
			without Brake	with Brake		
Connector for Motor Power Cable*		0.5, 0.9, 1.3	CE05-8A18-10SD-B-BAS CE3057-10A-1(D265)	CE05-8A20-15SD-B-BAS CE3057-12A-1(D265)	L-type connector Cable clamp	Limited Stock
		2.0, 3.0	CE05-8A22-22SD-B-BAS CE3057-12A-1(D265)	CE05-8A24-10SD-B-BAS CE3057-16A-1(D265)	L-type connector Cable clamp	
Connector for Holding Brake		All	CE05-8A10SL-3SC-B-BAS and CE3057-4A-1 (D265)		L-type connector for holding brake and Cable clamp (diameters 0.142 to 0.220in)	
Connector for Encoder Cable (incremental or absolute encoder)			CE02-6A20-29NSW and CE20BA-S and CE3057-12A-3(D265)		L-type connector (plug and back shell) and Cable clamp (diameters 0.265 to 0.394in)	

* Choose the connector and the associated cable clamp for a complete assembly. Connectors listed in this table are environmentally sealed.

** Connectors are manufactured by DDK and listed here with the largest standard cable clamp available.

SGMGH Gearmotors (1500rpm) - With Incremental/Absolute Encoder

Rated Output: 0.45kW, 0.85kW, 1.3kW,1.8kW, 2.9kW



For Additional Information	Page(s)
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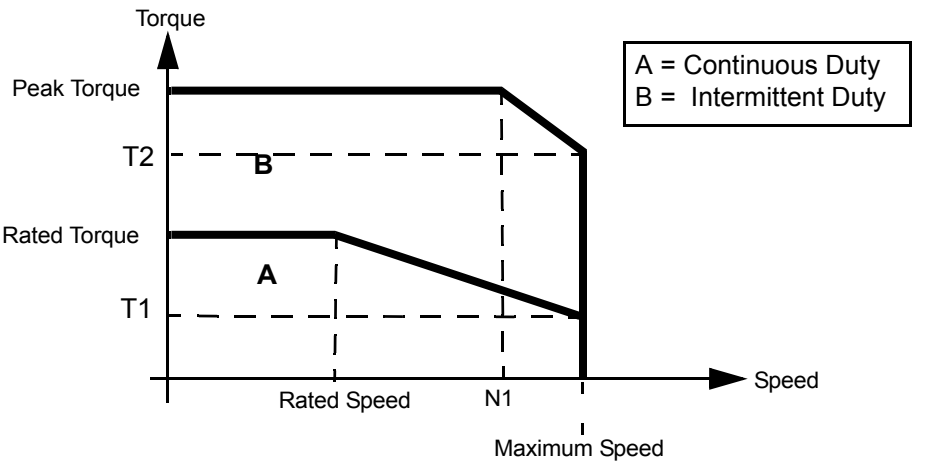
SGMGH Gearmotor Dimensions	68
SGMGH Gearmotor Selection/Ordering	69 - 75
FSP Ratings & Specifications	91 - 97
FSP Dimensions	98 - 104

Design Features

1. **Compact**
   - Fits in limited mounting space
   - High torque to inertia ratio
2. **Torque**
   - 383 to 30,090in • lb peak torque
   - Uses time-proven, Sigma motor technology
3. **Encoders**
   - 17-Bit (32,768 ppr x 4) incremental encoder (standard)
   - 17-Bit absolute encoder (option)
4. **Enhanced Environmental Resistance**
   - Totally enclosed, self-cooled IP67 (not including shaft)
5. **Application Emphasis**
   - Machine tools, woodworking machines, and thermoforming machines
   - Roll feeders
   - Press automation
   - Gantry robots
   - PCB drilling machines
   - Packaging machines
6. **Certified International Standards**
   - cUL recognized (File #: E165827), CE compliance

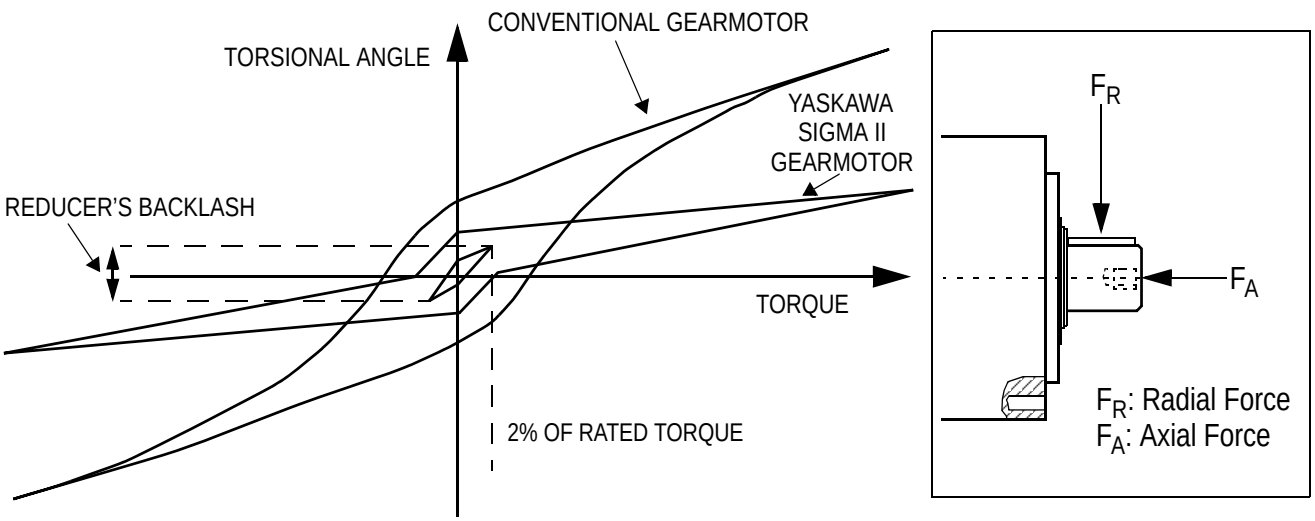
Gearmotor Ratings and Specifications

GEARMOTOR Part Number	Rated Torque (in • lb)	Peak Torque (in • lb)	Rated Speed (rpm)	Maximum Speed (rpm)	Speed N1 (rpm)	Torque T1 (in • lb)	Torque T2 (in • lb)
Standard SGMGH Gearmotors							
SG05SA-GA05AC	122	383	300	600	440	61	206
SG10SA-GA05AC	244	637	150	300	220	122	412
SG25SA-GA05AC	597	1770	60	120	88	298	1009
SG50SA-GA05AC	1194	3540	30	60	44	597	2018
SG05SA-GA09AC	231	592	300	600	560	116	498
SG10SA-GA09AC	463	1,185	150	300	280	232	996
SG25SA-GA09AC	1133	2901	60	120	112	568	2438
SG50SA-GA09AC	2266	3540	30	60	60	1135	3540
SG05SA-GA13AC	358	1000	300	600	550	179	721
SG10SA-GA13AC	716	1593	150	300	275	358	1442
SG25SA-GA13AC	1753	3540	60	120	110	877	3531
SG05SA-GA20AC	494	1232	300	600	560	244	1052
SG10SA-GA20AC	987	2464	150	300	280	494	2103
SG05SA-GA30AC	798	1936	300	600	500	399	1361

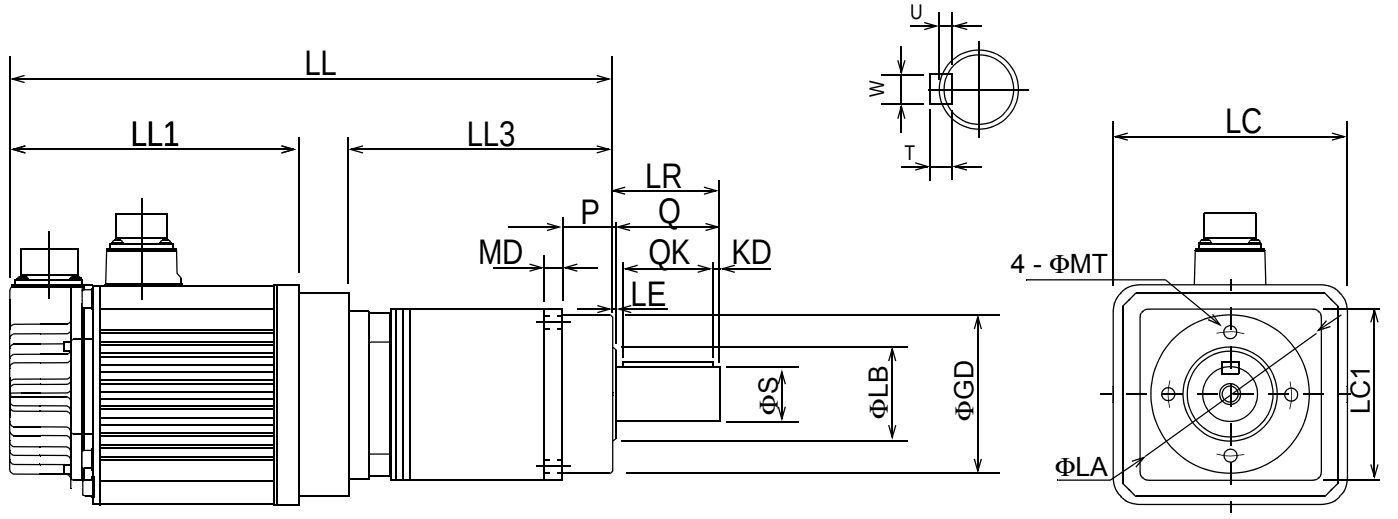


Gearmotor Mechanical Ratings

GEARMOTOR Part Number	Gearhead Backlash (arc min)	Gearhead Maximum.Radial Load (lb_f)	Gearhead Maximum Axial Load (lb_f)	Gearhead Inertia ($lb \cdot n \cdot s^2$)	Gearmotor Weight (lb)
Standard SGMGH Gearmotors					
SG05SA-GA05AC	<10	540	428	0.0016	21.14
SG10SA-GA05AC					
SG25SA-GA05AC		1035	900	0.0049	36.80
SG50SA-GA05AC		1687	1350	0.0047	58.30
SG05SA-GA09AC		540	428	0.0016	25.84
SG10SA-GA09AC		1035	900	0.0048	36.65
SG25SA-GA09AC		1687	1350	0.0047	63.00
SG50SA-GA09AC					
SG05SA-GA13AC		1035	900	0.0048	41.05
SG10SA-GA13AC					
SG25SA-GA13AC		1687	1350	0.0047	67.40
SG05SA-GA20AC		1687	1350	0.022	69.49
SG10SA-GA20AC					
SG05SA-GA30AC		1687	1350	0.022	78.29



Dimensions in inches (mm)



- **Standard SGMGH Gearmotors**

GEARMOTOR	LL1	LL3	LL	LE	LR	ΦLB	ΦGD	ΦS	P	LC	LC1	ΦLA	ΦMT*	MD*	Q	QK	KD	W	T	U
SG05SA-GA05AC	5.43 (138)	3.15 (80)	10.83 (275)	0.20 (5)	1.81 (46)	2.68 (68)	3.54 (90)	0.87 (22)	N/A	5.12 (130)	N/A	3.15 (80)	M6 x 1.0	0.47 (12)	1.42 (36)	1.26 (32)	0.08 (2)	0.24 (6)	0.24 (6)	0.14 (3.5)
SG10SA-GA05AC																				
SG25SA-GA05AC		5.30 (134.5)	12.62 (320.5)	0.24 (6)	2.76 (70)	3.54 (90)	4.72 (120)	1.26 (32)				4.25 (108)	M8 x 1.25	0.63 (16)	2.28 (58)	1.97 (50)	0.16 (4)	0.39 (10)	0.32 (8)	0.20 (5)
SG50SA-GA05AC		6.02 (153)	13.35 (339)	0.32 (8)	3.82 (97)	4.72 (120)	6.10 (155)	1.58 (40)				5.51 (140)	M10 x 1.5	0.79 (20)	3.23 (82)	2.76 (70)	0.24 (6)	0.47 (12)		
SG05SA-GA09AC	6.34 (161)	3.15 (80)	11.73 (298)	0.20 (5)	1.81 (46)	2.68 (68)	3.54 (90)	0.87 (22)				3.15 (80)	M6 x 1.0	0.47 (12)	1.42 (36)	1.26 (32)	0.08 (2)	0.24 (6)	0.24 (6)	0.14 (3.5)
SG10SA-GA09AC		4.02 (102)	12.24 (311)	0.24 (6)	2.76 (70)	3.54 (90)	4.72 (120)	1.26 (32)				4.25 (108)	M8 x 1.25	0.63 (16)	2.28 (58)	1.97 (50)	0.16 (4)	0.39 (10)	0.32 (8)	0.20 (5)
SG25SA-GA09AC		6.02 (153)	14.25 (362)	0.32 (8)	3.82 (97)	4.72 (120)	6.10 (155)	1.58 (40)				5.51 (140)	M10 x 1.5	0.79 (20)	3.23 (82)	2.76 (70)	0.24 (6)	0.47 (12)		
SG50SA-GA09AC																				
SG05SA-GA13AC	7.28 (185)	4.02 (102)	13.19 (335)	0.24 (6)	2.76 (70)	3.54 (90)	4.72 (120)	1.26 (32)				4.25 (108)	M8 x 1.25	0.63 (16)	2.28 (58)	1.97 (50)	0.16 (4)	0.39 (10)	0.32 (8)	0.20 (5)
SG10SA-GA13AC																				
SG25SA-GA13AC		6.02 (153)	15.20 (386)	0.32 (8)	3.82 (97)	4.72 (120)	6.10 (155)	1.58 (40)				5.51 (140)	M10 x 1.5	0.79 (20)	3.23 (82)	2.76 (70)	0.24 (6)	0.47 (12)		
SG05SA-GA20AC	6.54 (166)	4.82 (122.5)	13.92 (353.5)							7.48 (190)										
SG10SA-GA20AC																				
SG05SA-GA30AC	7.56 (192)		14.94 (379.5)																	

Note:* For Standard (SG) Gearmotors only: 4 x ΦMT threaded holes to a depth of dimension MD, set 90° apart.

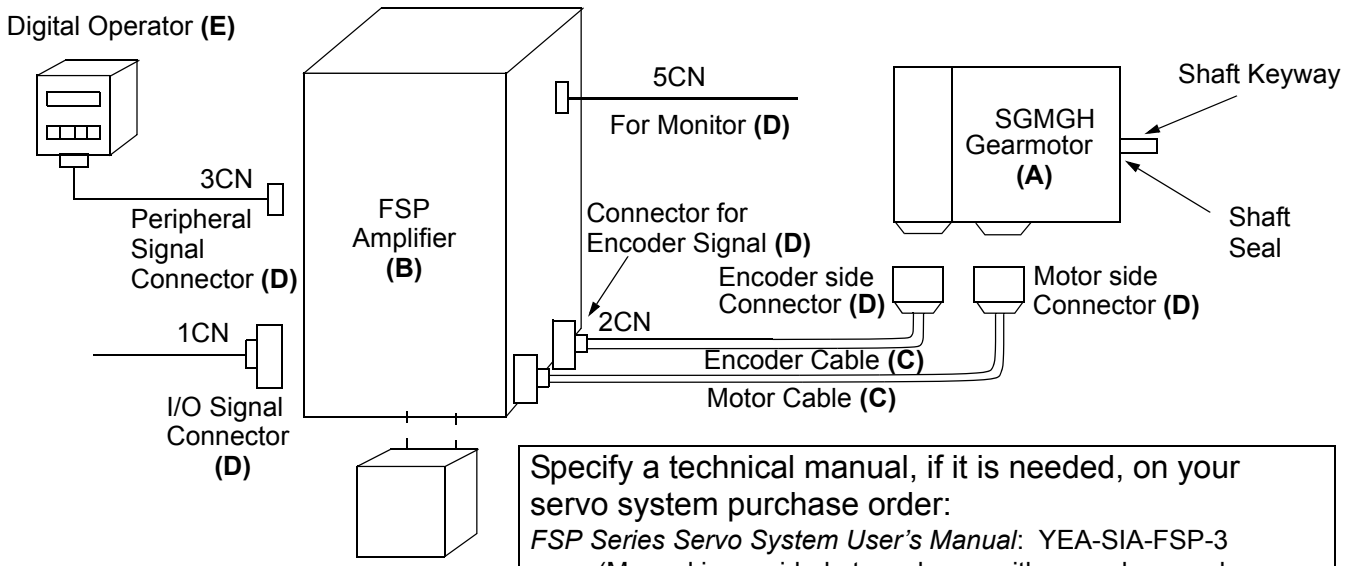
Specified Tolerances for Standard (SG) Gearmotor Models:

Dimension	ΦS		ΦLB		W	
Unit	Diameter	Tolerance	Diameter	Tolerance	Width	Tolerance
in	0.472, 0.630	+0.00047 +0.00004	1.378	+0.00000 -0.00063	0.158, 0.197, 0.236	+0.00000 -0.00118
	0.866	+0.00059 +0.00008	2.047, 2.677	+0.00000 -0.00075	0.39370	+0.00000 -0.00142
	1.260, 1.575	+0.00071 +0.00008	3.54331, 4.72441	+0.00000 -0.00087	0.47244	+0.00000 -0.00169
mm	12, 16	+0.012 +0.001	35	+0.000 -0.016	4, 5, 6	+0.000 -0.030
	22	+0.015 +0.002	52, 68	+0.000 -0.019	10	+0.000 -0.036
	32, 40	+0.018 +0.002	90, 120	+0.000 -0.022	12	+0.000 -0.043

Selecting: SGMGH Gearmotor System

First, select the Sigma II servomotor suited for your application using SigmaSize: the Yaskawa servomotor sizing software, available at www.yaskawa.com. (You may also request SigmaSize software via e-mail, at: literature@yaskawa.com).
Use the diagram below to locate and identify the components of your system. Each item is letter-coded and cross-referenced in the option tables on the following pages.

System Configuration



Specify a technical manual, if it is needed, on your servo system purchase order:
FSP Series Servo System User's Manual: YEA-SIA-FSP-3
(Manual is provided at no charge with a purchase order, but it must be requested).

Model Number Designation

SG 05 S A - GA 05 A 2 C

Sigma II Gearmotor Series
SG: Standard (<10 arc minute)

Reduction Ratio
04: 4:1 25: 25:1
05: 5:1 28: 28:1
07: 7:1 40: 40:1
10: 10:1 50: 50:1
16: 16:1 70: 70:1
20: 20:1

Construction
S: Standard

Orientation
A: For SG: Standard

Motor Series
G: SGMGH

Design Revision
A: SGMGH (1500rpm)

Motor Output
05: 0.45kW (0.6hp)
09: 0.85kW (1.14hp)
13: 1.3kW (1.7hp)
20: 1.8kW (2.4hp)
30: 2.9kW (3.9hp)

Power Supply
A: 200V

Encoder Specifications
C: 17-Bit Incremental Encoder
2: 17-Bit Absolute Encoder

Accessories
C: $24V_{dc}$ Brake
Blank:Standard YEA motor (stock)

Gearmotor & Amplifier Selection

Use this table below to select the appropriate SGMGH Sigma II gearmotor and amplifier. .

Description	Rated Torque (in • lb)	Peak Torque (in • lb)	Rated Speed (rpm)	Maximum Speed (rpm)	Gear Ratio	Gearmotor Model Number (**A**)	Amplifier MODEL # FSP- (**B**)*	Motor and Amplifier Item Class
200V, 3-phase 17-bit Incremental Encoder Straight Shaft with Keyway MS connectors	Standard SGMGH Gearmotors							Gear-motor: 3-4 weeks Amplifier: Stock
	122	383	300	600	5:1	SG05SA-GA05AC	08AMC–S	
	244	637	150	300	10:1	SG10SA-GA05AC		
	597	1770	60	120	25:1	SG25SA-GA05AC		
	1194	3540	30	60	50:1	SG50SA-GA05AC		
	231	592	300	600	5:1	SG05SA-GA09AC	10AMC	
	463	1185	150	300	10:1	SG10SA-GA09AC		
	1133	2901	60	120	25:1	SG25SA-GA09AC		
	2266	3540	30	60	50:1	SG50SA-GA09AC		
	358	1000	300	600	5:1	SG05SA-GA13AC	15AMC–S	
	716	1593	150	300	10:1	SG10SA-GA13AC		
	1753	3540	60	120	25:1	SG25SA-GA13AC		
	494	1232	300	600	5:1	SG05SA-GA20AC	20AMC	
	987	2464	150	300	10:1	SG10SA-GA20AC		
	798	1936	300	600	5:1	SG05SA-GA30AC	30AMC	

Notes: 1. These performance ratings apply when duty cycles are 60% or less, and when the gearmotor runs for 1,000 cycles per hour or less. Contact your Yaskawa representative when duty cycles exceed 60%, and when the gearmotor runs for more than 1,000 cycles per hour.

2. Rated Speed is at 20°C ambient temperature. Reduce Rated Speed by 20% at 40°C ambient temperature.
3. For right-angle gearmotors, please consult the factory for availability.
4. $24V_{DC}$ brakes for SGMGH Sigma II gearmotors are standard. Contact a local source for $24V_{DC}$ power supplies.
5. For technical information, request Yaskawa manual number YEA-SIA-FSP-3.

* For more detailed FSP amplifier specifications and dimensions, refer to pages 89 to 105.

Use the table below to select pre-wired cables for your SGMGH Sigma II gearmotor.

Pre-wired Cable Selection

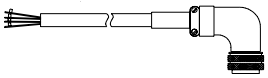
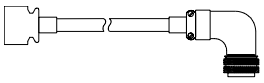
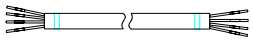
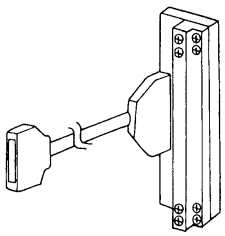
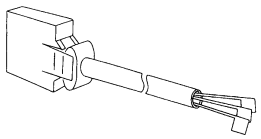
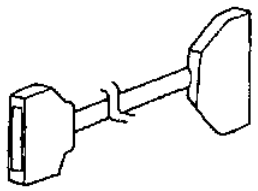
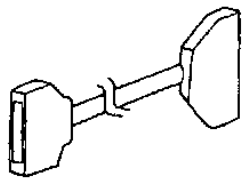
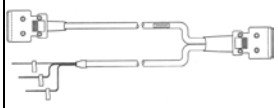
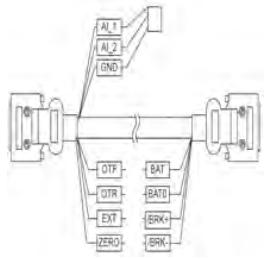
Cable Description **(C)**		Motor Size (kW)	Part Number* without Brake	Part Number* with Brake	Comments	Item Class
Power Cable with Connectors (IP67)		0.5, 0.9, 1.3	B1E-□□(A)	B1BE-□□(A)	Use the following key to specify needed cable length (last two digits of the part number): 03: 3m 05: 5m 10: 10m (standard) 15: 15m 20: 20m	Stock***
		2.0, 3.0	B2E-□□(A)	B2BE-□□(A)		
Encoder Cable (incremental or absolute)		All	AFGHCE-□□(A)			
Encoder feedback adapter cable for incremental and absolute*****	–		AFAD-P2(A)		Connects these full length encoder feedback cables to the FSP amplifier (Encoder feedback cables for SGDH amp) JZSP-CMP00-XX(A) A1ICE-XX(A) JZSP-CMP02-XX(B) 0.2 meter length	Stock
Encoder feedback adapter cable for absolute encoders. Cable has built in absolute encoder battery and case.	–		AFADABS-P2(A)		Connects these full length encoder feedback cables to the FSP amplifier (Encoder feedback cables for SGDH amp) JZSP-CMP00-XX(A) A1ICE-XX(A) JZSP-CMP02-XX(B) Built-in battery is: JZSP-BA01 0.2 meter length	
Encoder Cable (for applications up to 20m) Only for Solder Connections			FR-RMCT-SB		These cables are available in any length. For example: to order one FR-RMCT-SB cable, 16m long, specify: quantity:16 part no.:FR-RMCT-SB.	Stock**
Encoder Cable (for applications from >20 to <50m) Only for Solder Connections			UL20276-SB			
Input/Output 1CN Cable & Transition Terminal Block			JUSP-TA50P		35mm DIN rail mountable; the cable length is 0.5 meters.	
			JUSP–WA50P–□□		35mm DIN Rail mountable D50: 0.5 meters (standard) 01: 1 meter (standard) 02: 2 meters 03: 3 meters	

Table continued on next page.

Cable Description **(C)**		Motor Size (kW)	Part Number*		Comments	Item Class
			without Brake	with Brake		
Input/Output 1CN Cable with Pigtail Leads		All	JZSP-CKI01-□(A)		Use the following key to specify needed cable length (last digit of part number): 1: 1m (standard) 2: 2m 3: 3m	
Input/Output 1CN Cable Cable with Female D-Sub output Connector****			JZSP-CKI0D-□□		Use the following key to specify cable length (last two digits of the part number): D50: 0.5m 01: 1m (standard) 02: 2m 03: 3m	
Input/Output 1CN SMC4000 to FSP Interface Cable			SMCCBL2□□		Use the Following key to determine the desired length specification. □□= 02: 2 Feet 05: 5 Feet 10: 10 Feet 15: 15 Feet	Stock**
Input/Output 1CN SMC4000 to FSP Interface Cable with prepared alarm and reset inputs. requires jumper in SMC4000			SMCCBLH□□			
Input/Output 1CN SMC4000 to FSP Interface Cable with flying leads for additional amplifier I/O			SMCCBLB□□			Limited Stock
Input/Output 1CN MP2000 series controller to FSP Interface Cable			JEPMC–W2040–□□		Use the Following key to determine the desired length specification. □□= A5: 0.5 meters 01: 1 meter 03: 3 meters	

* "(A)" at the end of the cable number indicates the revision level. The revision level may be changed prior to this catalog's reprinting.

** When ordering these cables for motors with brakes, order the standard B5E power cable and the additional cable for the brake.

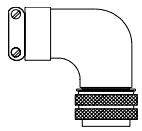
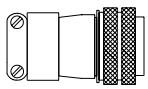
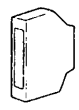
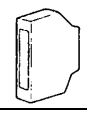
*** Standard cable lengths are Stock items; non-standard cable lengths are Limited Stock items.

**** 50 Pin Female D-Sub output connector mates to customer supplied third party terminal block. (e.g., Wago #289-449, Weidmuller #919658, Phoenix #2283647, Amphenol/Sine #20-51039, and many others).

***** For systems using the absolute encoder and this part number, the absolute encoder battery must be connected at the amplifier 1CN connector.

Connector Selection

Use the table below to select mating connectors for your SGMGH Sigma II gearmotor.

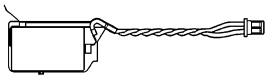
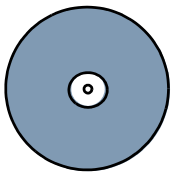
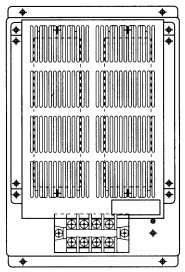
Connector Description **(D)**		Motor Size (kW)	Part Number		Comments	Item Class
			without Brake	with Brake		
MS Connector for Motor Power Cable *		0.5, 0.9, 1.3	MS3106B18-10S	MS3106B20-15S	Straight-type connector	Stock
			MS3108B18-10S	MS3108B20-15S	L-type connector	
			MS3057-10A	MS3057-12A	Cable clamp	
		2.0, 3.0	MS3106B22-22S	MS3106B24-10S	Straight-type connector	
			MS3108B22-22S	MS3108B24-10S	L-type connector	
			MS3057-12A	MS3057-16A	Cable clamp	
MS Connector for Encoder Cable (incremental or absolute encoder)		All	MS3106B20-29S		Straight-type connector	
			MS3108B20-29S		L-type connector	
			MS3057-12A		Cable clamp	
1CN Mating Connector			JZSP-CKI9		—	
2CN Amplifier Mating Connector			DE9406973*		–	
3CN Peripheral Mating Connector	—		YSC-1		—	
5CN Connector and 1m Cable with Pigtails	—		DE9404559		Can use 5CN for analog speed and torque monitor service checks.	

* Choose either a straight or L-type connector and the associated cable clamp for a complete assembly. For example, L-type connector MS3108B18-10S is compatible with cable clamp MS3057-10A.

** Alternate Part Number: DTCR6973

Peripheral Device Selection

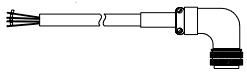
Use the table below to select peripheral devices for your SGMGH Sigma II gearmotor.

Component **(E)**		Part Number	Description	Item Class
Software Interface Cable	—	YS-12	Pre-wired 2.0m cable with 9-pin connector	Stock
Absolute Encoder Battery		JZSP-BA01-1	3.6V, 1000mAh (lithium battery) with 5cm leads for wiring to 1CN	
		JZSP-BA01	3.6V, 1000mAh (Lithium Battery) replacement battery for use in absolute adapter cable AFADABS-P2(A)	
Flexworks		FSPGUI1 or download at www.yaskawa.com	–	
External Regenerative Unit (Optional)		JUSP-RA04	These are general purpose regenerative units.* Order the Motion document: PI#99004 for setup instructions for this unit. **Caution:** Proper setup is necessary to avoid equipment damage.	
DC Reactor (for suppressing harmonics in the power supply)	For 200V: FSP-08AMC–S FSP-10AMC	X5079 X5061	—	Limited Stock
	FSP-15AMC-S FSP-20AMC	X5060		
	FSP-30AMC	X5059		

* For an alternate solution, specify the individual resistor part number RH500N25_OHMK in necessary series or parallel connection. Refer to the FSP servo amplifier section of this catalog for additional specifications, and the *FSP Series Servo System User's Manual* (YEA-SIA-FSP-3) for proper resistor sizing guidelines.

CE Pre-wired Cable Selection

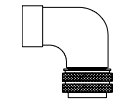
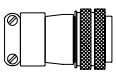
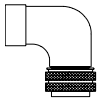
Use the table below to select shielded pre-wired power cables for your SGMGH Sigma II gearmotor.

Cable Description **(C)**		Motor Size (kW)	Part Number*		Comments	Item Class
			without Brake	with Brake		
Power Cable with Connectors (IP67)		0.5, 0.9, 1.3	B1CE-□□(A)	B1BCE-□□(A)	Use the following key to specify needed cable length (last two digits of the part number): 03: 3m 05: 5m 10: 10m (standard) 15: 15m 20: 20m	Limited Stock
		2.0, 3.0	B2CE-□□(A)	B3BCE-□□(A)		

* The "(A)" at the end of the cable number indicates the revision level. The revision level may be subject to change prior to this catalog's reprinting.

CE Connector Selection

Use the table below to select mating connectors for your SGMGH Sigma II gearmotor.

Connector Description **(D)**		Motor Size (kW)	Part Number		Comments**	Item Class
			without Brake	with Brake		
Connector for Motor Power Cable*	 	0.5, 0.9, 1.3	CE05-8A18-10SD-B-BAS CE3057-10A-1(D265)	CE05-8A20-15SD-B-BAS CE3057-12A-1(D265)	L-type connector Cable clamp	Limited Stock
		2.0, 3.0	CE05-8A22-22SD-B-BAS CE3057-12A-1(D265)	CE05-8A24-10SD-B-BAS CE3057-16A-1(D265)	L-type connector Cable clamp	
Connector for Holding Brake		All	CE05-8A10SL-3SC-B-BAS and CE3057-4A-1 (D265)		L-type connector for holding brake and Cable clamp (diameters 0.142 to 0.220in)	
Connector for Encoder Cable (incremental or absolute encoder)			CE02-6A20-29NSW and CE20BA-S and CE3057-12A-3(D265)		L-type connector (plug and back shell) and Cable clamp (diameters 0.265 to 0.394in)	

* Choose the connector and the associated cable clamp for a complete assembly. The connectors listed in the table are suitable for IP67 environments.

** Connectors are manufactured by DDK and listed here with the largest standard cable clamp available.

NOTES:

Super High Power Rate Series

SGMSH Servomotors - With Incremental / Absolute Encoder

Rated Output: 1.0kW, 1.5kW, 2.0kW, 3.0kW,

For Additional Information	Page(s)
SGMSH Ratings & Specifications	78
SGMSH Speed/Torque Curves	79
SGMSH Dimensions	80 - 81
SGMSH Selection/Ordering Information	82 - 88
FSP Ratings & Specifications	91 - 97
FSP Dimensions	98 - 104

Design Features

1. **Compact**
   - Small sized motor
     Six frame sizes: up to 422in • lb peak torque
2. **High Speed**
   - Rated Speed: 3000rpm
   - Maximum Speed: 5000rpm
3. **Encoders**
   - 17-bit (32,768 ppr x 4) incremental encoder (standard)
   - 17-bit absolute encoder (option)
4. **Enclosure**
   - Totally enclosed, self-cooled IP67 (excluding shaft)
   - IP67 with shaft seal (option)
5. **Application Emphasis**
   - High torque to inertia ratio
   - Chip mounters
   - PCB drilling machines
   - Robots
   - Conveyors
   - Packaging
6. **Certified International Standards**
   - UL, cUL recognized (File #: E165827), CE compliance

Servomotor Ratings and Specifications

Time Rating:	Continuous	Enclosure:	Totally-enclosed, self-cooled IP67 (except for shaft opening)	Maximum Rotational Speed:	5000rpm
Insulation:	Class F				
Vibration:	15μm or less	Ambient Temperature:	0 to 40ºC	Excitation:	Permanent magnet
Withstand Voltage:	$1500V_{ac}$	Ambient Humidity:	20 to 80% (non-condensing)	Drive Method:	Direct drive
Insulation Resistance:	10MΩ minimum at $500V_{DC}$	Rated Speed:	3000rpm	Mounting:	Flange-mounted
				Painting Color:	Muncell notation N1.5

Amplifier System Voltage	MOTORS: SGMSH-	Rated Output*	Rated Torque*		Instantaneous Peak Torque*		Rated Current*	Instantaneous Maximum Current*
		kW (hp)	N • m	KG • cm (lb • in)	N • m	KG • cm (lb • in)	A_{rms}	A_{rms}
$200V_{ac}$	10A□A	1.0 (1.3)	3.18	32.4 (28.2)	9.54	97.2 (84.4)	5.7	17
	15A□A	1.5 (2.0)	4.9	50 (43.4)	14.7	150 (130)	9.7	28
	20A□A	2.0 (2.7)	6.36	65 (56.4)	19.1	195 (169)	12.7	42
	30A□A	3.0 (4.0)	9.8	100 (87)	29.4	300 (260)	18.8	56

MOTORS SGMGH-	Torque Constant	Moment of Inertia		Holding Brake (at 20°C)					Allowable Load Inertia	Rated Power Rate*	Rated Angular Acceleration*	Inertia Time Constant	Inductive Time Constant
				Capacity	Torque	Coil Resistance	Rated Current	Additional Inertia					
	$\frac{lb_f \cdot in}{A_{rms}}$ $(\frac{N \cdot m}{A_{rms}})$	$lb_f \cdot in \cdot s^{2.} \times 10^{-3}$	$KG \cdot m^2 \times 10^{-4}$	W	N • m	Ω	A	$lb_f \cdot in \cdot s^{2.} \times 10^{-3}$	$KG \cdot m^2 \times 10^{-4}$	kW/s	rad/s^2	ms	ms
10A□A	5.6 (0.64)	1.54	1.74	7.0	7.84	82.3	0.29	0.289	8.7	57.9	18250	0.87	7.1
15A□A	5.0 (0.56)	2.19	2.47						12.4	97.2	19840	0.71	7.7
20A□A	4.8 (0.55)	2.82	3.19						16.0	127	19970	0.58	8.3
30A□A	5.1 (0.57)	6.20	7.00	9.85	20.0	58.7	0.41	1.89	35.0	137	14000	0.74	13.0

* These items and torque-speed characteristics quoted in combination with an FSP servo amplifier at an armature winding temperature of 20°C.

Note: These characteristics can be obtained when the following heat sinks (steel plates) are used for cooling purposes:

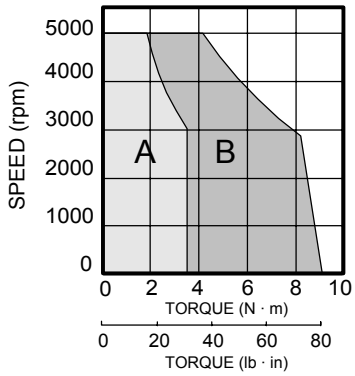
Type 10A□A to 20A□A: $(11.81 \times 11.81 \times 0.47$ (in)) $(300 \times 300 \times 12$ (mm))

Type 30A□A: $(15.75 \times 15.75 \times 0.79$ (in)) $(400 \times 400 \times 20$ (mm))

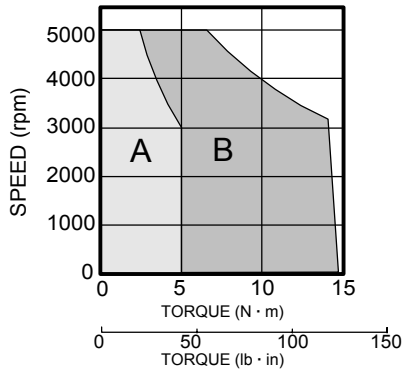
Speed / Torque Curves

200V

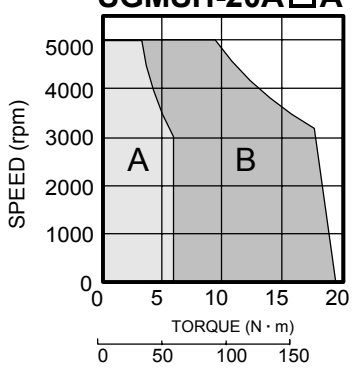
SGMSH-10A□A



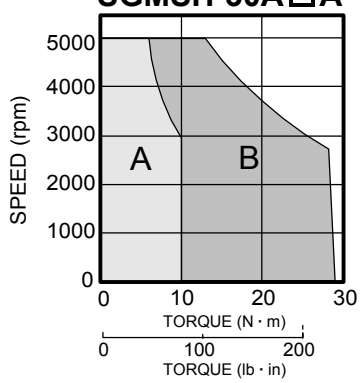
SGMSH-15A□A



SGMSH-20A□A



SGMSH-30A□A

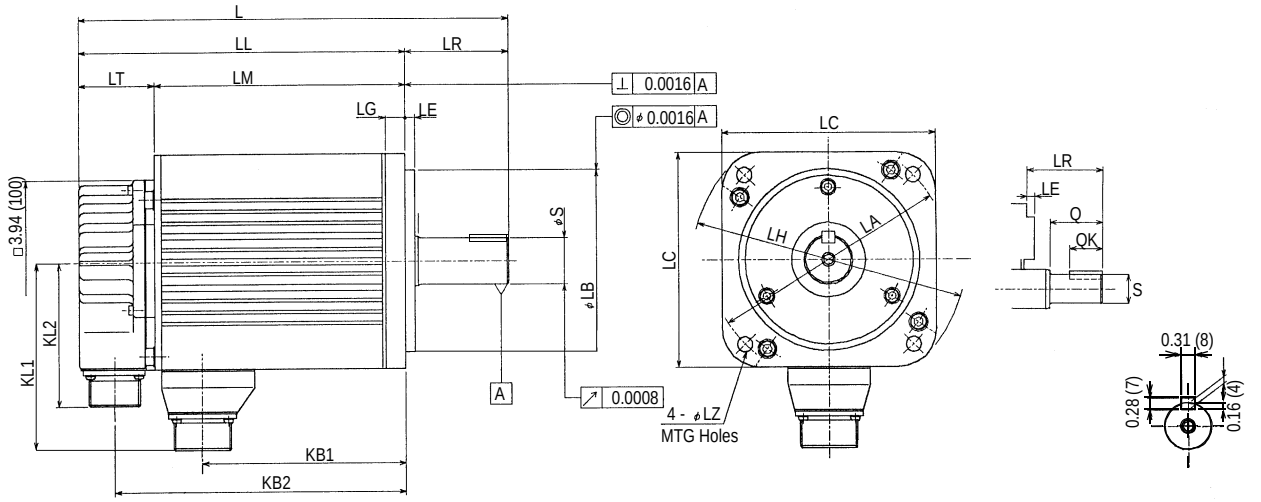


A : CONTINUOUS DUTY ZONE

B : INTERMITTENT DUTY ZONE

Dimensions in inches (mm)

(1) 17-bit Incremental or Absolute Encoder

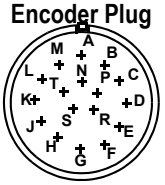


Type SGMSH-	L	LL	LM	LR	LT	KB1	KB2	KL1	KL2	Flange Dimensions							Shaft End Dimension			Approximate Mass lb$_f$ (kg)	Allowable Radial Load lb$_f$ (N)	Allowable Thrust Load lb$_f$ (N)
										ΦLA	ΦLB	LC	LE	LG	ΦLH	ΦLZ	ΦS	Q	QK			
10A□A61	7.64 (194)	5.87 (149)	4.06 (103)	1.77 (45)	1.81 (46)	2.99 (76)	5.04 (128)	3.78 (96)	3.43 (87)	4.53 (115)	3.74 (95)	3.94 (100)	0.12 (3)	0.39 (10)	5.12 (130)	0.28 (7)	0.94 (24)	1.57 (40)	1.26 (32)	10.1 (4.6)	154 (686)	44 (196)
15A□A61	8.66 (220)	6.89 (175)	5.08 (129)			4.02 (102)	6.06 (154)													12.8 (5.8)		
20A□A61	9.57 (243)	7.8 (198)	5.98 (152)			4.92 (125)	6.97 (177)													15.4 (7.0)		
30A□A61	10.31 (262)	7.83 (199)	6.02 (153)	2.48 (63)		4.8 (122)	7.01 (178)	4.49 (114)	3.43 (87)	5.71 (145)	4.33 (110)	5.12 (130)	0.24 (6)	0.47 (12)	6.5 (165)	0.35 (9)	1.1 (28)	2.17 (55)	1.96 (50)	24.3 (11)	220 (980)	88 (392)

Note: 1. Dimensions are the same when using either incremental or absolute encoders (with or without optional shaft seal).
2. Tolerances on the dimensions of flange type LB and shaft extensions S are based on JIS (Japanese Industrial Standard) B0401 "Limits and Fits for Engineering."

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.9449, 1.1024	+0.0000-0.0005	3.7402, 4.3307	+0.0000 -0.0014
mm	24.000, 28.000	+0.000 -0.013	95.000, 110.000	+0.000 -0.035

Encoder Plug

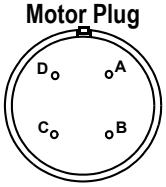


MS3102A20-29P

Connector Wiring on the Incremental Encoders			
A	—	K	—
B	—	L	—
C	Data +	M	—
D	Data –	N	—
E	—	P	—
F	—	R	—
G	0V	S	Battery – (Note*)
H	+5V$_{dc}$	T	Battery + (Note*)
J	FG (Frame Ground)	*Note: Used with an absolute encoder only.	

Non-Environmental Mating Connector:
MS3108B20-29S (L Type)
MS3106B20-29S (Straight Type)
Cable Clamp: MS3057-12A

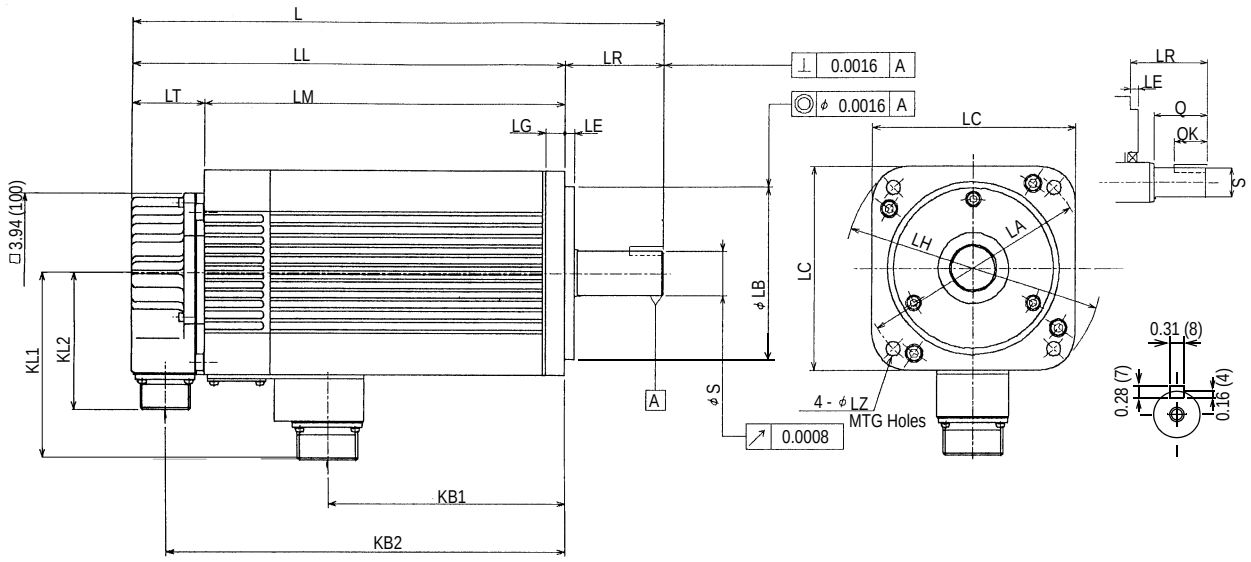
Motor Plug



MS3102A22-22P

Connector Wiring on the Motor Side	
A	U Phase
B	V Phase
C	W Phase

(2) 17-bit Incremental or Absolute Encoder, with Brake

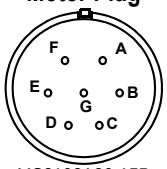


Type SGMSH-	L	LL	LM	LR	LT	KB1	KB2	KL1	KL2	Flange Dimensions							Shaft End Dimension			Approximate Mass lb$_f$ (kg)	Allowable Radial Load lb$_f$ (N)	Allowable Thrust Load lb$_f$ (N)
										ΦLA	ΦLB	LC	LE	LG	ΦLH	ΦLZ	ΦS	Q	QK			
10A□A6C	9.37 (238)	7.6 (193)	5.79 (147)	1.77 (45)	1.81 (46)	2.64 (67)	6.77 (172)	3.94 (100)	3.43 (87)	4.53 (115)	3.74 (95)	3.94 (100)	0.12 (3)	0.39 (10)	5.12 (130)	0.28 (7)	0.94 (24)	1.57 (40)	1.26 (32)	13.2 (6.0)	154 (686)	44 (196)
15A□A6C	10.39 (264)	8.62 (219)	6.81 (173)	1.77 (45)		3.66 (93)	7.8 (198)													16.5 (7.5)		
20A□A6C	11.3 (287)	9.53 (242)	7.72 (196)	1.77 (45)		4.57 (116)	8.7 (221)													18.7 (8.5)		
30A□A6C	11.81 (300)	9.33 (237)	7.52 (191)	2.48 (63)		4.45 (113)	8.5 (216)	4.69 (119)		5.71 (145)	4.33 (110)	5.12 (130)	0.24 (6)	0.47 (12)	6.5 (165)	0.35 (9)	1.1 (28)	2.17 (55)	1.96 (50)	30.9 (14)	220 (980)	88 (392)

Note: 1. Dimensions are the same when using either incremental or absolute encoders (with or without optional shaft seal).
2. Tolerances on the dimensions of flange type LB and of shaft extensions S are based on JIS (Japanese Industrial Standard) B0401 "Limits and Fits for Engineering."

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.9449, 1.1024	+0.0000- 0.0005	3.7402, 4.3307	+0.0000 -0.0014

Motor Plug



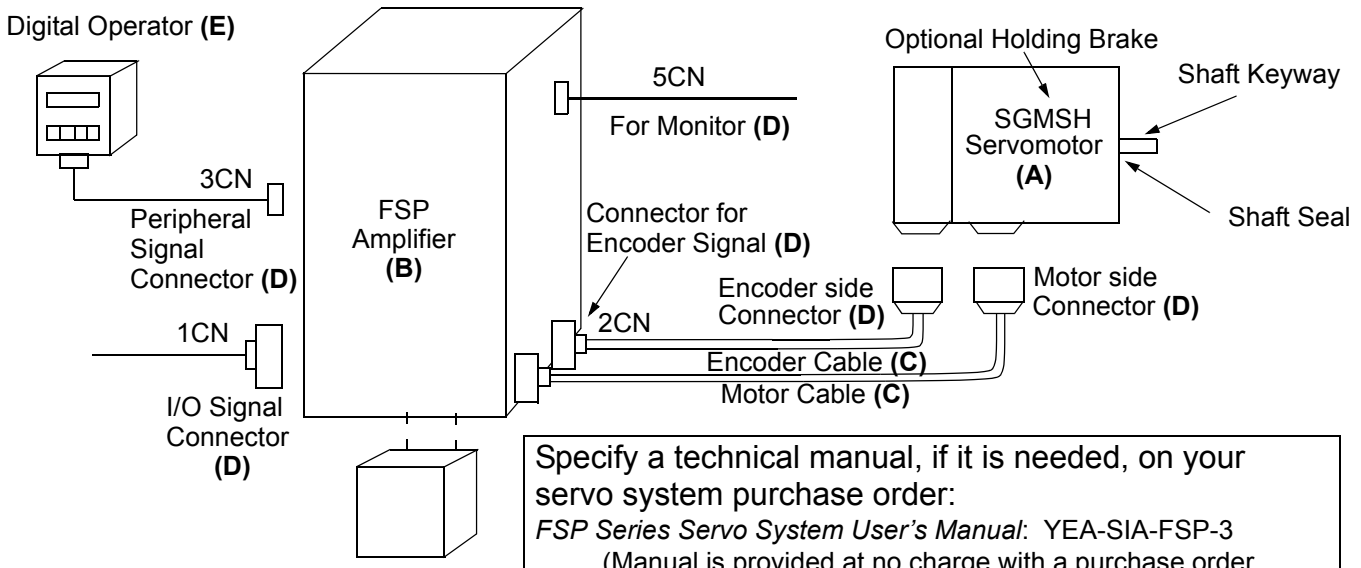
MS3102A20-15P

Connector Wiring on the Motor Side			
A	U Phase	E	Brake Terminal
B	V Phase	F	Brake Terminal
C	W Phase	G	—
D	FG (Frame Ground)	—	—

Selecting: SGMSH Sigma II Servo System

First, select the Sigma II servomotor suited for your application using SigmaSize: the Yaskawa servomotor sizing software, available at www.yaskawa.com. (You may also request SigmaSize software via e-mail, at: literature@yaskawa.com).
Use the diagram below to locate and identify the components of your system. Each item is letter-coded and cross-referenced in the option tables on the following pages.

System Configuration



Specify a technical manual, if it is needed, on your servo system purchase order:
FSP Series Servo System User's Manual: YEA-SIA-FSP-3
(Manual is provided at no charge with a purchase order, but it must be requested).

Model Number Designation

SGMSH - 10 A C A 6 1

Sigma Servomotor Type

Rated Output*
- 10: 1.0kW (1.3hp)
- 15: 1.5kW (2.0hp)
- 20: 2.0kW (2.7hp)
- 30: 3.0kW (4.0hp)

Power Supply
- A: 200V

Accessories
- 1: Standard
- C: $24V_{DC}$ Brake
- S: Shaft Seal
- E: Shaft Seal and Brake

Shaft Specifications
- 6: Straight Shaft with Keyway

Rated Speed
- A: 3000rpm

Encoder Specifications
- C: 17-bit Incremental Encoder
- 2: 17-bit Absolute Encoder

* 4.0kW and 5.0kW motor available at 400 volts.

Servomotor & Amplifier Selection

Use the table below to select the appropriate SGMSH Sigma II servomotor and amplifier.
(Refer to the motor model # designation on the previous page specifying the available modification to motor construction/features.)

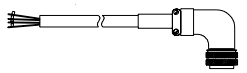
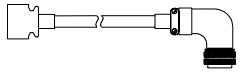
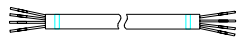
Description	Peak Torque (in • lb)	Rated Torque (in • lb)	Motor Inertia (in • lb • s^2 X 10^{-3})	Motor MODEL # (A)	Amplifier MODEL # (B)* Analog/Digital Input FSP-	Motor & Amplifier Item Class
200V, Three-Phase 17-bit Incremental Encoder Straight Shaft with Keyway 5000rpm maximum MS Connectors	84.4	28.2	1.54	SGMSH-10ACA61	10AMC	Stock
			1.76	SGMSH-10ACA6C		
	130	43	2.19	SGMSH-15ACA61	15AMC–S	
			2.41	SGMSH-15ACA6C		
	169	56.4	2.82	SGMSH-20ACA61	20AMC	
			3.04	SGMSH-20ACA6C		
	260	87	6.2	SGMSH-30ACA61	30AMC	
			8.1	SGMSH-30ACA6C		

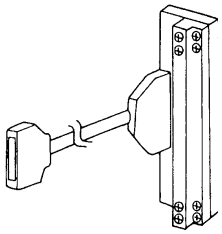
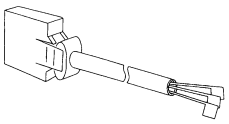
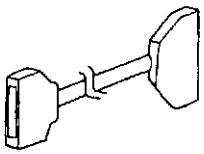
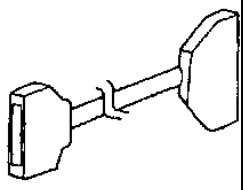
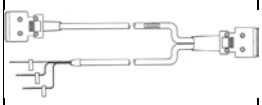
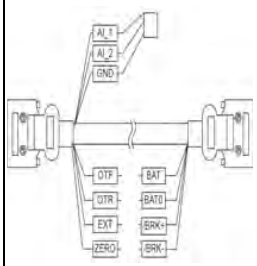
Note: $24V_{DC}$ brakes for SGMSH Sigma II servomotors are standard. Contact a local source for $24V_{DC}$ power supplies. For technical information, request Yaskawa manual number YEA-SIA-FSP-3.

* For more detailed FSP amplifier specifications and dimensions, refer to pages 99 - 112.

Pre-wired Cable Selection

Use the table below to select pre-wired cables for your SGMSH Sigma II servomotor.

Cable Description (C)		Motor Size (kW)	Part Number*		Comments	Item Class
			without Brake	with Brake		
Power Cable with L-type Connectors (IP67)		1.0, 1.5, 2.0	B1E-□□(A)	B1BE-□□(A)	Use the following key to specify needed cable length (last two digits of the part number): 03: 3m 05: 5m 10: 10m (standard) 15: 15m 20: 20m	Stock**
		3.0	B2E-□□(A)	B2BE-□□(A)		
Encoder Cable (incremental or absolute) (IP67)		All	AFGHCE-□□(a)			
Encoder feedback adapter cable for incremental and absolute*****	–		AFAD-P2(A)		Connects these full length encoder feedback cables to the FSP amplifier (Encoder feedback cables for SGDH amp) JZSP-CMP00-XX(A) A1ICE-XX(A) JZSP-CMP02-XX(B) 0.2 meter length	
Encoder feedback adapter cable for absolute encoders. Cable has built in absolute encoder battery and case.	–		AFADABS-P2(A)		Connects these full length encoder feedback cables to the FSP amplifier (Encoder feedback cables for SGDH amp) JZSP-CMP00-XX(A) A1ICE-XX(A) JZSP-CMP02-XX(B) Built-in battery is: JZSP-BA01 0.2 meter length	
Encoder Cable (for applications up to 20m) Only for Solder Connections			FR-RMCT-SB		These cables are available in any length. For example, to order one FR-RMCT-SB cable, 16m long, specify: quantity: 16 part no.: FR-RMCT-SB	
Encoder Cable (for applications from >20 to <50m) Only for Solder Connections			UL20276-SB			

Cable Description (C)		Motor Size (kW)	Part Number*		Comments	Item Class
			without Brake	with Brake		
Input/Output 1CN Cable & Transition Terminal Block		All	JUSP-TA50P		35mm DIN rail mountable; the cable length is 0.5 meters.	Stock**
			JUSP–WA50P–□□		35mm DIN Rail mountable D50: 0.5 meters (standard) 01: 1 meter (standard) 02: 2 meters 03: 3 meters	
Input/Output 1CN Cable with Pigtail Leads			JZSP-CKI01-□(A)**		Use the following key to specify required cable length (last digit of part number): 1: 1m (standard) 2: 2m 3: 3m	
Input/Output 1CN Cable Cable with Female D-Sub output Connector***			JZSP-CKI0D-□□		Use the following key to specify cable length (last two digits of the part number): D50: 0.5m 01: 1m (standard) 02: 2m 03: 3m	
Input/Output 1CN SMC4000 to FSP Interface Cable			SMCCBL2□□		Use the Following key to determine the desired length specification. □□= 02: 2 Feet 05: 5 Feet 10: 10 Feet 15: 15 Feet	
Input/Output 1CN SMC4000 to FSP Interface Cable with prepared alarm and reset inputs. requires jumper in SMC4000			SMCCBLH□□			
Input/Output 1CN SMC4000 to FSP Interface Cable with flying leads for additional amplifier I/O			SMCCBLB□□			Limited Stock
Input/Output 1CN MP2000 series controller to FSP Interface Cable			JEPMC–W2040–□□		Use the Following key to determine the desired length specification. □□= A5: 0.5 meters 01: 1 meter 03: 3 meters	

* "(A)" at the end of the cable number is the revision level. The revision level may be changed prior to this catalog's reprinting.

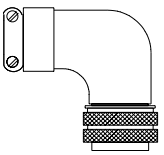
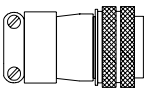
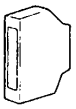
** Standard cable lengths are Stock items; non-standard cable lengths are Limited Stock items.

*** 50 Pin Female D-Sub output connector mates to customer supplied third party terminal block. (e.g., Wago #289-449, Weidmuller #919658, Phoenix #2283647, Amphenol/Sine #20-51039, and many others).

**** For systems using the absolute encoder and this part number, the absolute encoder battery must be connected at the amplifier 1CN connector.

Connector Selection

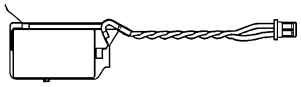
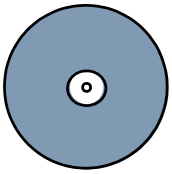
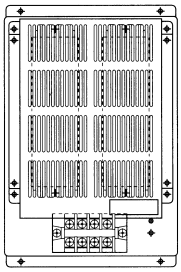
Use the table below to select mating connectors for your SGMSH Sigma II servomotor.

Connector Description (D)		Motor Size (kW)	Part Number		Comments	Item Class
			without Brake	with Brake		
MS Connector for Motor Power Cable *		1.0, 1.5, 2.0	MS3106B18-10S	MS3106B20-15S	Straight-type connector	Stock
			MS3108B18-10S	MS3108B20-15S	L-type connector	
			MS3057-10A	MS3057-12A	Cable clamp	
		3.0	MS3106B22-22S	MS3106B24-10S	Straight-type connector	
			MS3108B22-22S	MS3108B24-10S	L-type connector	
			MS3057-12A	MS3057-16A	Cable clamp	
MS Connector for Encoder Cable (incremental or absolute encoder)		All	MS3106B20-29S		Straight-type connector	
			MS3108B20-29S		L-type connector	
			MS3057-12A		Cable clamp	
1CN Mating Connector			JZSP-CKI9		—	
2CN Encoder Mating Connector			JZSP-CMP9-1		—	
3CN Peripheral Mating Connector	—		YSC-1		—	
5CN Connector and 1m Cable with Pigtails	—		DE9404559		—	

* Choose either a straight or L-type connector and the associated cable clamp for a complete assembly.

Peripheral Device Selection

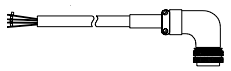
Use the table below to select peripheral devices for your SGMSH Sigma II servomotor.

Component (E)		Part Number	Description	Item Class
Software Interface Cable	—	YS-12	Pre-wired 2.0m cable with 9-pin connector	Stock
Absolute Encoder Battery		JZSP-BA01-1	3.6V, 1000mAh (lithium battery) with 5cm leads for wiring to 1CN	
		JZSP-BA01	3.6V, 1000mAh (Lithium Battery) replacement battery for use in absolute adapter cable AFAD-ABS-P2(A)	
Flexworks		FSPGUI1 or download at www.yaskawa.com	–	
External Regenerative Unit (Optional)		JUSP-RA04	These are general purpose regenerative units.* Order the Motion document: PI#99004 for setup instructions for this unit. **Caution:** Proper setup is necessary to avoid equipment damage.	
DC Reactor (for suppressing harmonics in the power supply)	FSP-10AMC	X5061	—	Limited Stock
	FSP-15AMC-S FSP-20AMC	X5060		
	FSP-30AMC	X5059		

* For an alternate solution, specify the individual resistor part number RH500N25_OHMK in necessary series or parallel connection. Refer to the FSP servo amplifier section of this catalog for additional specifications, and the *FSP Series Servo System User's Manual* (YEA-SIA-FSP-3) for proper resistor sizing guidelines.

CE Pre-wired Cable Selection

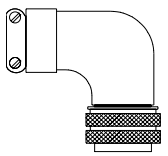
Use the table below to select shielded pre-wired cables for your SGMSH Sigma II servomotor. These are suitable for IP67 environments.

Cable Description (C)		Motor Size (kW)	Part Number*		Comments	Item Class
			without Brake	with Brake		
Power Cable with Connectors (IP67)		1.0, 1.5, 2.0	B1CE-□□(A)	B1BCE-□□(A)	Use the following key to specify required cable length (last digit of part number): 03. 3m 05: 5m 10: 10m (standard) 15: 15m 20: 20m	Limited Stock
		3.0	B2CE-□□(A)	B3BCE-□□(A)		

* The "(A)" at the end of the cable number indicates the revision level. The revision level may be subject to change prior to this catalog's reprinting.

CE/IP67 Connector Selection

Use the table below to select mating connectors for your SGMSH Sigma II servomotor.

Connector Description (D)		Motor Size (kW)	Part Number*		Comments	Item Class
			without Brake	with Brake		
Connector for Motor Power Cable**		1.0, 1.5, 2.0	CE05-8A18-10SD-B-BAS CE3057-10A-1(D265)	CE05-8A20-15SD-B-BAS CE3057-12A-1(D265)	L-type connector Cable clamp	Limited Stock
		3.0	CE05-8A22-22SD-B-BAS CE3057-12A-1(D265)	CE05-8A24-10SD-B-BAS CE3057-16A-1(D265)	L-type connector Cable clamp	
Connector for Encoder Cable (incremental or absolute encoder)		All	CE02-6A20-29NSW and CE20BA-S CE3057-12A-3(D265)		L-type connector (plug and back shell) Cable clamp (for diameters 0.265 to 0.394in)	

* Connectors are manufactured by DDK and listed here with the largest standard cable clamp available.

** Choose the connector and the associated cable clamp for a complete assembly. The connectors listed in the table are suitable for IP67 environments.

Sigma FSP Series Amplifier

For Speed, Torque, & Position Control with Incremental or Absolute Encoder

For Additional Information	Page(s)
FSP Ratings & Specifications	92 - 96
FSP Dimensions	99 - 106
Connection Diagram, Single Phase	107
Connection Diagram, Three Phase	108
Connector Terminal Block Unit	109
Terminal Block Pin Numbers	110
Cable Specs and Peripherals	111-115
SGMAH Sigma II Servo System	5 -22
SGMPH Sigma II Servo System	23 -40
SGMPH Gearmotor	41 -51
SGMGH Sigma II Servo System	53 -64
SGMGH Gearmotor	65 -75
SGMSH Sigma II Servo System	77 -88

Design Features

1. Flexible Servo Architecture

- Traditional torque, speed, and pulse input modes (SGDH modes)
- Additional Programmable position mode for simple indexing applications
- Electronic gearing, indexing superimposed on gear ratio
- Electronic am table with shift and offset while in motion
- Dynamic positioning, change target speed or position while in motion

2. Improved Performance

- Patented Non-linear Control Technology reduces tracking error 90% in some applications
- Adaptive feed forward dramatically reduces settling time and overshoot
- High speed input and output for integrating motion (125 usec)
- Registration input (CN1-46) for latching position in hardware (62.5 usec)

3. Easy Operation

- FlexWorks set-up software provides a project setup Wizard
  - Choose amplifier mode
  - Define user units
  - Get default motion profile values
  - Define end of motion parameters
  - Define digital I/O
- In addition, Flexworks provides
  - Programming by pull down menu
  - Digital oscilloscope tuning
  - Advanced FFT mechanical analysis
- Sigma FSP automatically recognizes Yaskawa Sigma II motors
- RMS torque monitor of front panel

4. CN10 side port for <u>future*</u> expanded capabilities (MECHATROLINK)

5. Certified International Standards

- UL, cUL listed, CE compliance

*Contact Yaskawa Rep

Model Number Designation

FSP - 0 8 A MC - ☐

FSP Servo Amplifier

Rated Output
- A3: 0.03kW
- A5: 0.05kW
- 01: 0.10kW
- 02: 0.20kW
- 04: 0.40kW
- 08: 0.75kW
- 10: 1.00kW
- 15: 1.50kW
- 20: 2.00kW
- 30: 3.00kW

Power Supply
- A: 200V
- B: 100V

Control Type: See Table Below

Options:
- ☐: No options
- C: Electronic Cam (ECAM)
- S: Single Phase Amplifier (08 and 15 only)

Control Type	Details
MC	• Flexible ServoPack with standard Yaskawa serial encoder feedback for use with Sigma II motors.
MH	• Flexible ServoPack with A-B quadrature encoder feedback with Hall effect commutation.* • No Yaskawa serial encoder feedback. • Servo Amplifier - Motor combinations supported by Yaskawa can be found at www.Yaskawa.com under the FSP product section: Special Purpose Motors.

IMPORTANT:
* Parameter settings for motor combinations that are not in this catalog can only be set at the factory. For further information, see the Special Purpose Motor Program at www.yaskawa.com under the FSP product section.

Sigma FSP Combinations **		
Sigma FSP	**FSP-xxxMC**	**FSP-xxxMH**
Servomotors (one size up or down by power)	Rotary SGMAH, SGMPH, SGMGH, SGMSH, SGMUH - **NO SGMCS** Linear SGLGW, SGLFW, SGLTW, Sigma Trac with Serial Converter	SPM - Special Purpose Motor Requires FSP-xxxMH model and Supported Motor Data File - **NO Yaskawa Serial Encoder**
Option Modules	NS115 Mechatrolink II Planned for Mid 2007** Expanded I/O (8in/8out) Planned for Mid 2007** - **No NS300, NS500, NS600, MP940**	NS115 Mechatrolink II Planned for Mid 2007** Expanded I/O (8in/8out) Planned for Mid 2007** - **No NS300, NS500, NS600, MP940**
Software	FlexWorks only	FlexWorks only

** Consult www.yaskawa.com for recent updates

FSP Amplifier Ratings and Specifications

FSP-			A3	A5	01	02	04	08	10	15	20	30
Applicable Servomotor	100V	SGMAH-☐B	A3	A5	01	02	—	—	—	—	—	—
		SGMPH-☐B	—	—	01	02	—	—	—	—	—	—
	200V	SGMAH-☐A	A3	A5	01	02	04	08	—	—	—	—
		SGMPH-☐A	—	—	01	02	04	08	—	15	—	—
		SGMGH-☐A (1500rpm)	—	—	—	—	—	05	09	13	20	30
		SGMSH-☐A	—	—	—	—	—	—	10	15	20	30
Basic Specifications	Maximum Applicable Servomotor Capacity [kW]		0.03	0.05	0. 10	0.20	0. 40	0.75	1.0	1.5	2.0	3.0
	100V	Continuous Output Current [A_{rms}]]	0.66	0.95	2.4	3.0	—	—	—	—	—	—
		Maximum Output Current [A_{rms}]	2.0	2.9	7.2	9.0	—	—	—	—	—	—
	200V	Continuous Output Current [A_{rms}]]	0.44	0.64	0.91	2.1	2.8	5.7	7.6	11.6	18.5	24.8
		Maximum Output Current [A_{rms}]	1.3	2.0	2. 8	6.5	8. 5	13.9	17	28	42	56

Ratings and Specifications (cont'd)

FSP-Amplifier Model FSP-				A3-01	02	04	08	10	15	20	30
Basic Specifications	Input Power Supply*	Main Circuit	100V	Single-phase 100 to 115VAC +10 to -15%, 50/60Hz *							
			200V	Single/Three-phase 200 to 230VAC +10 to -15%, 50/60Hz *							
		Control Circuit	100V	Single-phase 100 to 115VAC +10 to -15%, 50/60Hz *							
			200V	Single-phase 200 to 230.5VAC +10 to -15%, 50/60Hz							
	Control Method			Single or three-phase full-wave rectification IGBT-PWM (sine wave driven)							
	Feedback			For Yaskawa servomotors: Serial encoder: 13- (incremental only), 16-, or 17-bit (incremental/absolute) For Special Purpose Motors: A-B quadrature, max frequency 800 kHz post quadrature							
	Conditions	Ambient/Storage Temperature **		0 to +55°C/-20 to +85°C (When enclosed, internal temperatures must not exceed this range)							
		Ambient/Storage Humidity		90% relative humidity or less (with no condensation)							
		Vibration/Shock Resistance		4.9 m/s^2 /19.6 m/s^2							
	Configuration			Base mounted (Rack mounted optional)							
	FSP-			**A3-01**	**02**	**04**	**08**	**10**	**15**	**20**	**30**
	Approx. Mass [kg (lb)]	For 100V		0.8 (1.76)	1.1 (2.43)	—					
		For 200V			0.8 (1.76)	1.1 (2.43)	1.7 (3.75)		2.8 (6.17)		3.8 (8.38)

Ratings and Specifications (cont'd)

FSP-				A3	A5	01	02	04	08	10	15	20	30
Speed and Torque Control Modes	Performance	Speed Control Range		1:5000 (The lowest speed of the speed control range is the point just before the motor stops under full-load condition.)									
		Speed Regulation ***	Load Regulation	0 to 100% load: 0.01% maximum (at rated speed)									
			Voltage Regulation	Rated Voltage ±10%: 0% (at rated speed)									
			Temperature Regulation	25 ± 25°C: ±0.1% max. (at rated speed)									
		Frequency Characteristics		400Hz (at $J_L = J_M$)									
		Torque Control Tolerance (Repeatability)		±2%									
		Soft Start Time Setting		0 to 10s (Can be set individually for acceleration and deceleration)									
	Input Signals	Speed Reference Input	Reference Voltage****	±6V_{DC} (Variable setting range: ±2 to ±10V_{DC}) at rated torque (positive torque reference with positive reference), input voltage: ±12V (maximum).									
			Input Impedance	About 14k									
			Circuit Time Constant	—									
		Torque Reference Input	Reference Voltage****	±3V_{DC} (Variable setting range: ±1 to ±10V_{DC}) at rated torque (positive torque reference with positive reference), input voltage: ±12V (maximum)									
			Input Impedance	About 14k									
			Circuit Time Constant	About 47µs									
		Contact Speed Reference	Rotation Direction Selection	With P control signal									
			Speed Selection	With forward/reverse current limit signal (speed 1 to 3 selection), servomotor stops or another control method is used when both are OFF.									
Position Control Mode	Performance	Bias Setting		0 to 450rpm (setting resolution: 1rpm)									
		Feed Forward Compensation		0 to 100% (setting resolution: 1%)									
		Positioning Completed Width Setting		0 to 250 reference units (setting resolution: 1 reference unit)									
	Input Signals	Reference Pulse	Type	Sign + pulse train, 90° phase difference 2-phase pulse (A phase + B phase), or CCW + CW pulse train									
			Form	Line driver (+5V level), open collector (+5V or +12V level)									
			Frequency	500/200kpps maximum (line driver/open collector).									
		Control Signal		Clear Signal (input pulse form identical to reference pulse)									
		Built-in Open-Collector Power Supply*****		+12V (1kbuilt-in resistor)									

Ratings and Specifications (cont'd)

FSP-			A3	A5	01	02	04	08	10	15	20	30
I/O Signals	Position	Output Form	A -, B -, C - phase line driver S - phase line driver (only with an absolute encoder)									
		Frequency Dividing Ratio	Any									
	Sequence	Signal allocation can be modified	Servo ON, P control (or Control Mode switching, forward/ reverse motor rotation by internal speed setting, zero clamping, reference pulse prohibited), forward run prohibited (P-OT), reverse run prohibited (N-OT), alarm reset, forward current limit, and reverse current limit (or internal speed selection)									
	Sequence	Fixed Output	Servo alarm, 3-bit alarm codes.									
		Signal allocation can be modified	Positioning completed (speed coincidence), during servomotor rotation, servo ready, during current limiting, during speed limiting, brake released, warning, selecting three of the NEAR signals.									
Internal Functions	Dynamic Brake		Operated at main power OFF, servo alarm, servo OFF, or overtravel.									
	Regeneration		External regenerative resistor.					Built-in.				
	Overtravel Stop		Dynamic brake stops at P-OT or N-OT, deceleration to a stop, or free run to a stop.									
	Electronic Gear		$0.01 \leq A/B \leq 100$									
	Protection		Overcurrent, overload, regenerative error, main circuit voltage error, heat sink overheat, power open phase, overflow, overspeed, encoder error, encoder disconnected, overrun, CPU error, parameter error									
	LED Display		Charge, Power, five 7-segment LEDs (built-in digital operator functions)									
	CN5 Analog Monitoring		Built-in analog monitor connector to observe speed, torque and other reference signals. Speed: 1V/1000rpm Torque: 1V/rated torque Pulses remaining: 0.05V/reference unit or 0.05V/100 reference units									
	Communications	Connected Devices	RS-422A port such as for a personal computer (RS-232C ports under certain conditions)									
		1:N Communications	Up to N = 14 for RS-422A ports									
		Axis Address Setting	Set with parameters.									
		Functions	Status display, parameter setting, monitor display, alarm trace-back display, JOG and auto-tuning operations, speed/torque reference signal, and other graphing functions									
	Others		Reverse rotation connection, home position search, automatic servomotor ID, DC reactor connection terminal for high power supply frequency control									

Notes: * The power voltage must not exceed 230V +10% (253V). If it is likely that it will exceed this limit, use a step-down transformer. For types FSP-08AMC-S and FSP-15AMC-S, voltage is 200 to 230V + 10% -5%.

** Use the servo amplifier within the ambient temperature range. When enclosed, the temperatures inside the cabinet must not exceed the specified range.

*** Speed regulation is defined as follows:

$$\text{Speed regulation} = \frac{(\text{no-load motor speed - full-load motor speed})}{\text{rated motor speed}} \times 100\%$$

**** Forward is clockwise viewed from the non-load side of the servomotor, (counterclockwise viewed from the load and shaft end).

*****The built-in open collector power supply is not electrically isolated from the control circuit in the servo amplifier.

Programmable Mode Specifications

The FSP-series is equipped with four control modes, Torque, Speed, Position, and Programmable. For details on the Torque, Speed, and Position modes, see the FSP User's Manual (YEA-SIA-FSP-3).

Programmable Mode Functions

In this mode the FSP Amp controls sequence and motion profiles. Sequence timing can be controlled by a host through digital I/O.

Configurable Single Axis Control Functions	
Units	Position, speed, acceleration units
Default Motion Profile	Speed, accel, jerk smoothing time
Quick Stop	Quick stop deceleration
Torque Slope	Rate of change of commanded torque
In Position Window	Motion end window (Pn2C0)

Functions programmable in user program or set by serial communication commands in programmable mode	
Inputs	The 7 sequence inputs are programmable in this mode (unless configured for an embedded function)
Outputs	The 3 sequence outputs are programmable in this mode (unless configured for an embedded function)
Homing	Homing to external switch, encoder index pulse, external switch and encoder index pulse, home to a hard stop, and set motor position to zero
PTP Motion	Point-to-point motion based on programmable motion profile
Electronic Gear	Motion synchronized to master encoder by electronic gear ratio
Phase Shift to Electronic Gear	Motion superimposed on gear ratio using programmable motion profile
Position Latch	High speed latch of motor encoder and master encoder with programmable registration distance (62.5 microseconds)
Registration	Programmable registration distance from latched motor encoder position
Electronic CAM	Motion synchronized to master encoder or virtual axis by electronic cam profile
Torque Mode	Motor torque set by analog input or program command (125 microsecond torque loop update)
Speed Mode	Motor speed set by analog input, pulse reference input, or program command with and without position loop closed (infinite jog)
Multi_Axis Synch	Multiple axes start of motion synchronized by serial or serial communication
Input Synch	Fast input for synchronizing motion to external events (new_move_enable 125 usec)
Output Synch	Fast output for synchronizing external events to motion (fast_output_setting 125 usec)
System Properties	Torque limits and Global Gain Factor (Pn1AO)

Programmable motion profile functions	
Basic PTP Motion	Target position, speed, accel, jerk smoothing time
Profile Change On The Fly	Target position, speed, and accel programmable while in motion
Phase Shift	Phase shift position, speed, and acceleration programmable while synchronized to the master by electronic gear
Soft Gear Engagement	Acceleration for synchronizing motion to master encoder by electronic gear ratio
Custom Profiles	Custom profile based on table with ECAM engaged to virtual master

O

Math Functions	
Integer Math Operators	*,/,MOD,+,-,AND,XOR,OR

Program Flow	
Basic Program Flow	RUN, END, LABEL, GO_TO, LOOP
Condition Branching	IF, IF_INPUT, INPUT_CASE
Subroutines	CALL, LABEL, RETURN
Interupts	8 user prioritized Interrupts based on external events or logical conditions (EXT_INT, INT, INT_RETURN)
Timing	DELAY, WAIT_EXACT, WAIT_FOR_START, WAIT_INPUT, WAIT_STOP, WAIT_VAR
Auto-Run	Run program at power up at specified label (Pn2CC)
Fault Management	ALARM_RESET, FAULT_MANAGER, FAULT_MANAGER_RETURN, FAULT_MESSAGE_CLEAR

ECAM	
Profiles	4 ECAM profiles per project
Master	ECAM to master encoder or virtual master
Cyclic	Cyclic or Non-Cyclic synchronization
Segments	16 segments per profile
Resolution	Configurable segment resolution, up to 256 table points with table interpolation
Interpolation	Straight line, sinusoidal, or table interpolation between segments
Design	FlexWorks ECAM Editor or import point table from CSV file
Synchronization	Engage and disengage cam based on logical condition or external event
Scaling	Master and motor ECAM profile scaling (profile x B/A)
Shifting	Master and motor ECAM profile shifting with ECAM engaged (profile +/- C)

Variables	
User Variables	10 variables, each 32 bits
Arrays	Read and Write to 512 point array
System Variables	See table In Chapter 9 of the FlexWorks User's Manual: YEA-SIA-FSP-4
Functionality	Use variables in math, as arguments in commands, and in expressions

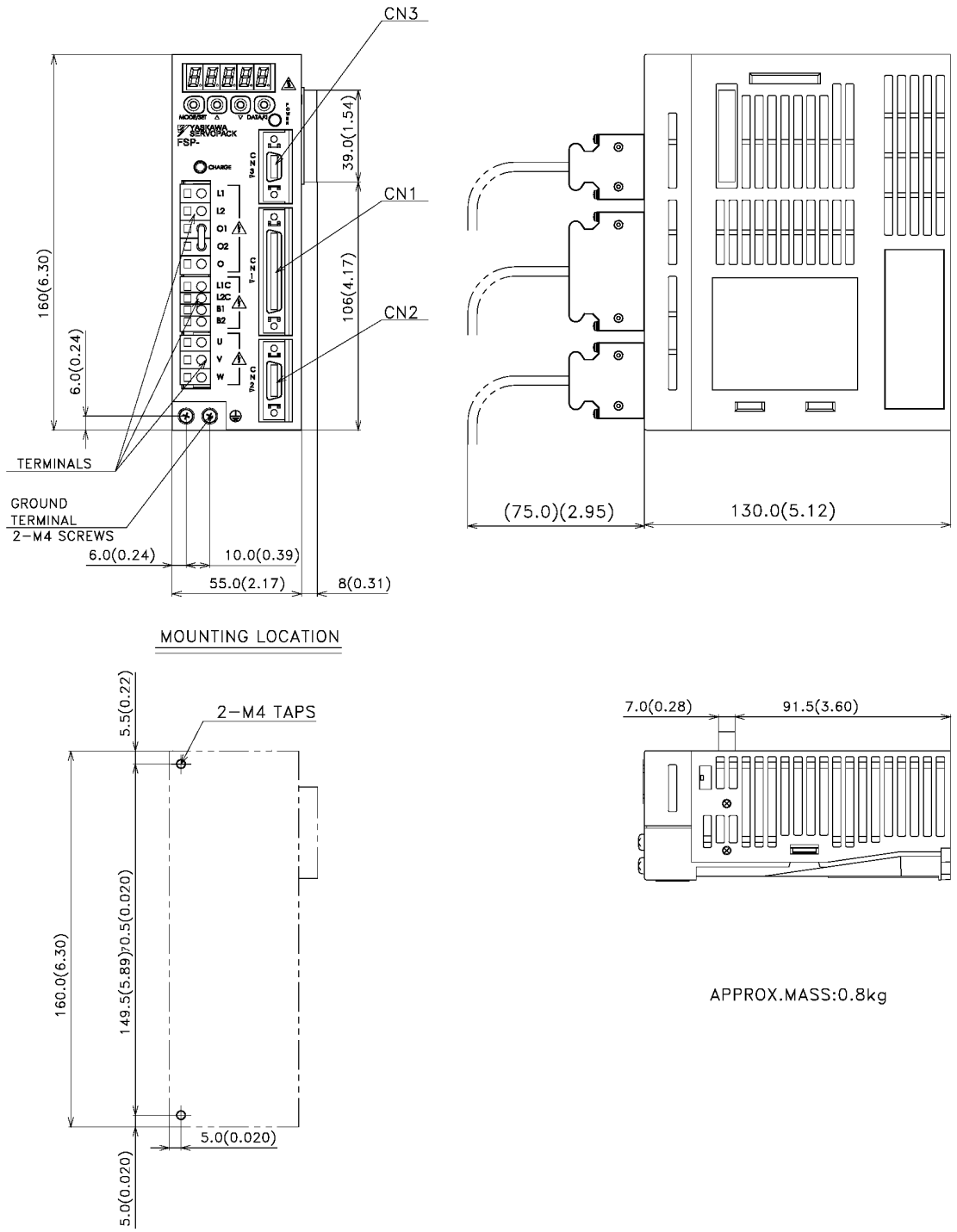
Programming System Properties	
Program line maximum execution time	2 ms
Time between motion commands stored in the Motion Command Buffer	125 usec
Total number of programming lines	100 lines (if ECAM is installed) 180 lines (if ECAM is not installed)

Serial Communication	
Baud Rate	19200 autodetect
Bit Structure	Start - 1 bit, data - 7 bit ASCII code, stop - 1 bit, even number parity - 1 bit, start stop synchronization - 1 bit
Amplifier Address	15 units, 1-F address in hexadecimal
Protocol	N Protocol see FlexWorks User's Manual: YEA-SIA-FSP-4
Master Message	Broadcast, polling, program, immediate, and sequential mode commands
Functions	Send programming commands, configure ECAM profile, clear program or sequential buffer, read or write to the array, read and write parameters, read system variables, read version number, poll for amplifier status, read or write user variables
Checksum	Enabled or disabled by Pn2C6

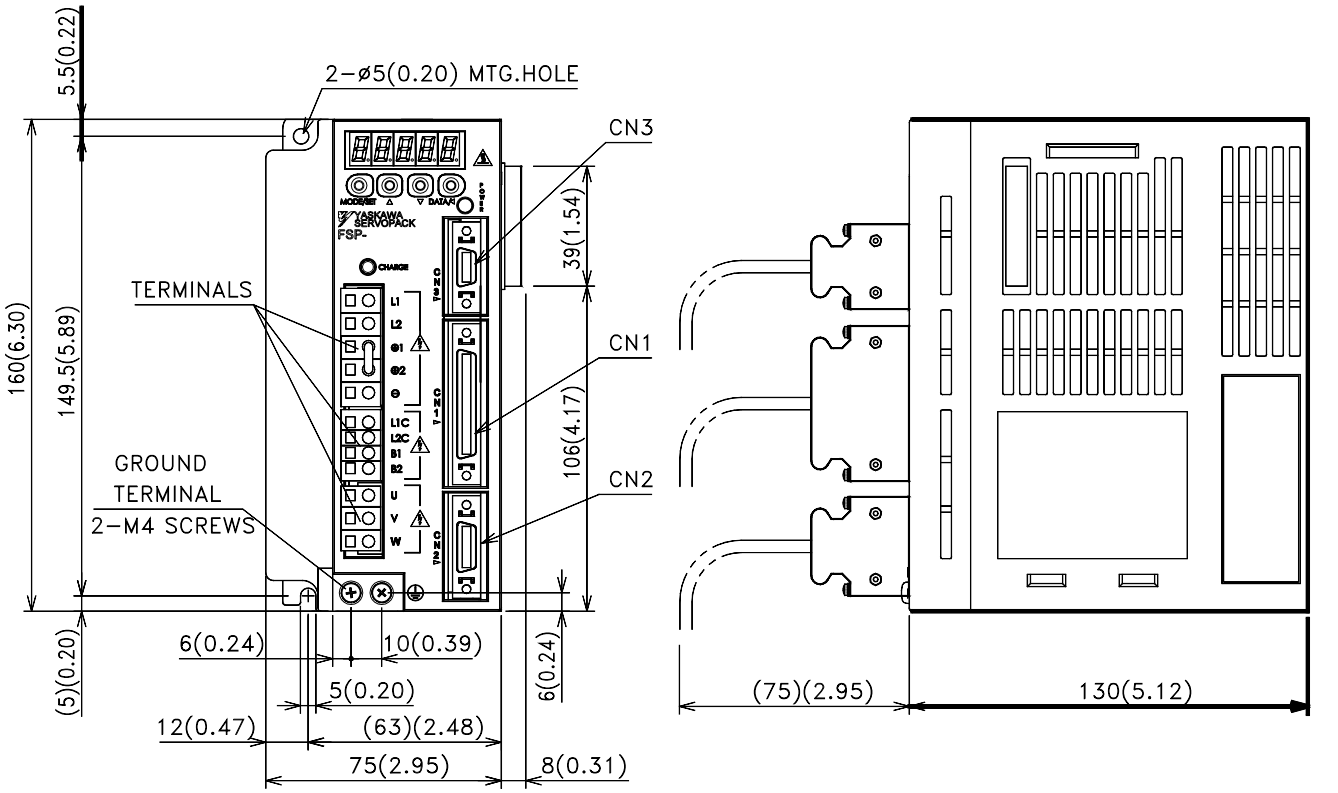
Dimensions in inches (mm)

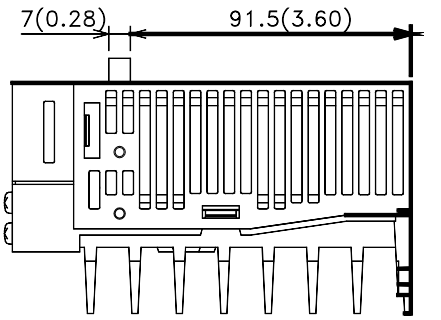
FSP Servo Amplifier (Standard)

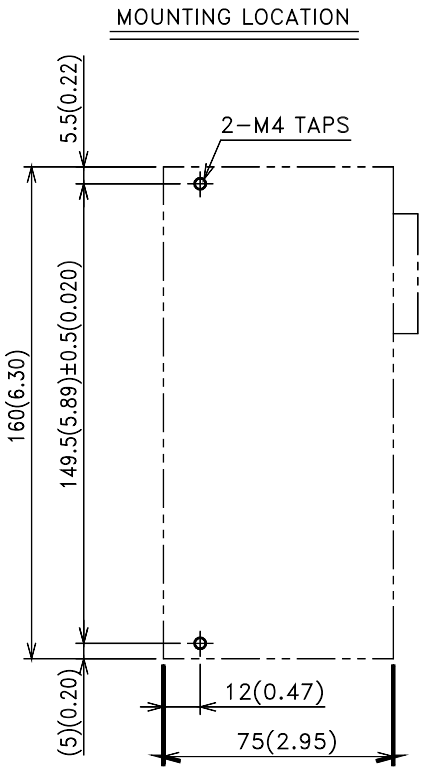
- **FSP-A3A□□ to -02A□□ (200V Single-phase, 30 to 200W) and**
- **FSP-A3B□□ to -01B□□ (100V Single-phase, 30 to 100W)**



- **FSP-04A□□ (200V Single-phase, 400W) and**
- **FSP-02B□□ (100V Single-phase, 200W)**

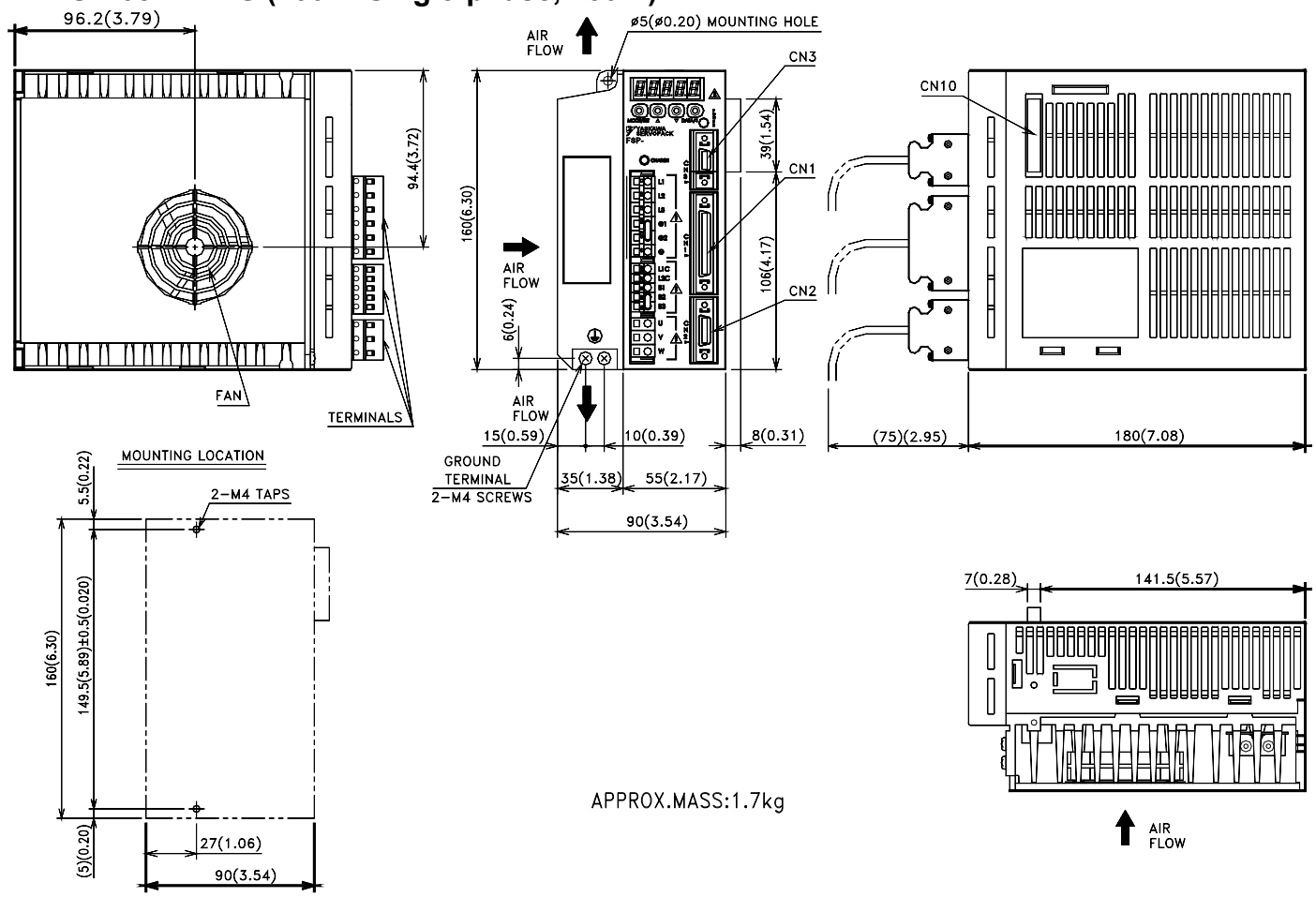






APPROX.MASS:1.1kg

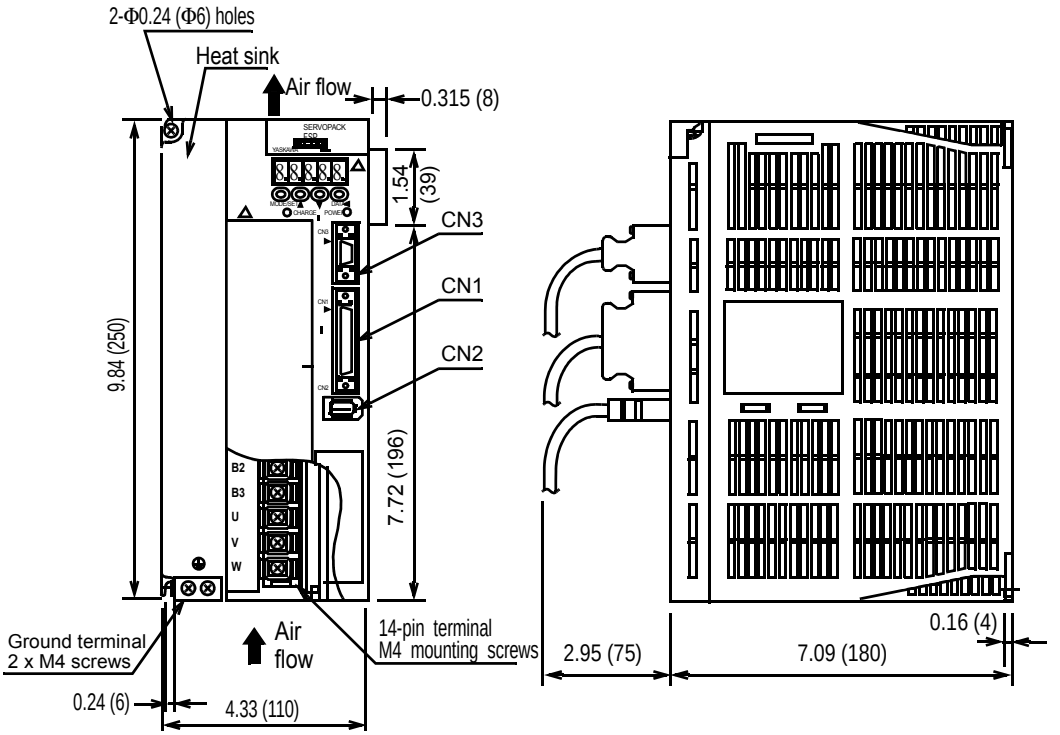
- **FSP-10A□□ (200V Three-phase, 1.0kW)**
- **FSP-08A□□-S (200V* Single-phase, 750W)**



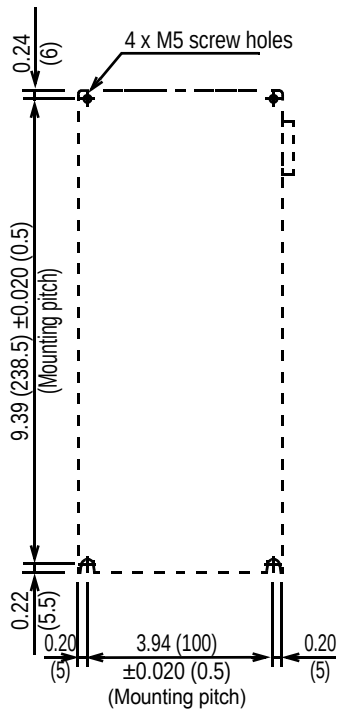
FSP Servo Amplifiers

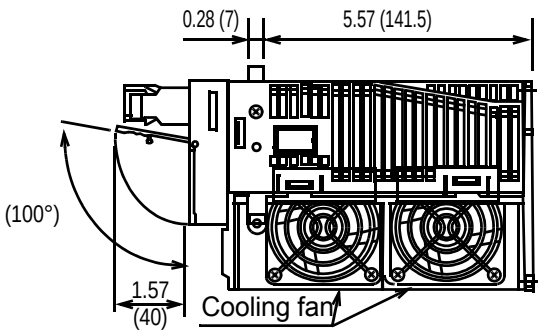
* Rating 200 to 230V_{ac} +10% -5%

- **FSP-20A□□, 30A□□ (200V Three-phase, 2.0kW, 3.0kW)**
- **FSP-15A□□-S (200V Single-phase, 1.5 kW)***



Mounting Hole Diagram



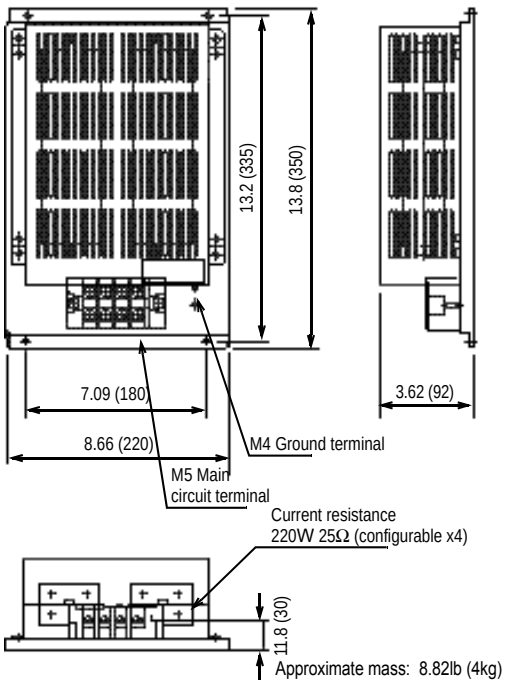


Approximate mass: 8.38lb (3.8kg)

* Rating: 200 to 230V_{ac} +10%, -5%

Regenerative Resistor Units (JUSP-RA04)

- **Type JUSP-RA04**



External Regenerative Resistors

Regenerative resistors for servo amplifiers are internally or externally mounted, as shown in the following table. They can be mounted externally on all servo amplifiers, but are especially effective when regenerative energy exceeds the servo amplifier's capacity.

When mounted externally, be sure to remove the jumper between B2 and B3, which deactivates the internal regenerative resistor.

Important: External regeneration resistor sizing and amplifier set-up will be important for proper operation.

Use Yaskawa's SigmaSize software available at www.yaskawa.com and the *FSP Series Servo System User's Manual:* YEA-SIA-FSP-3.

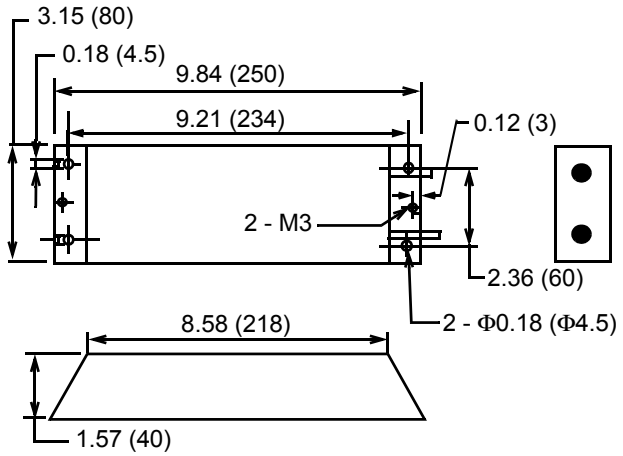
Applicable Servo Amplifier		Regenerative Resistor Mounted in a Servo Amplifier		Internal Regeneration Power Capacity (W)	Minimum Allowable Resistance (Ω)
		Resistance (Ω)	Wattage* (W)		
200V Single-phase	FSP-A3AMC	—	—	—	40
	FSP-A5AMC				
	FSP-01AMC				
	FSP-02AMC				
	FSP-04AMC				
	FSP-08AMC-S	50	60	12	
	FSP-15AMC-S	25	140	28	20
200V Three-phase	FSP-10AMC	50	60	12	40
	FSP-20AMC	25	140	28	12
	FSP-30AMC	12.5			
100V Single-phase	FSP-A3BMC	—	—	—	40
	FSP-A5BMC				
	FSP-01BMC				
	FSP-02BMC				

* Capacity prior to derating. If regeneration power requirements exceed internal capacity of the amp, install an external regeneration resistor (reference "Minimum Allowable Resistance". Be sure to derate wattage of external resistor to 20% or less (natural convection) and to 50% or less with forced air cooling.

Single Regeneration Resistance Units

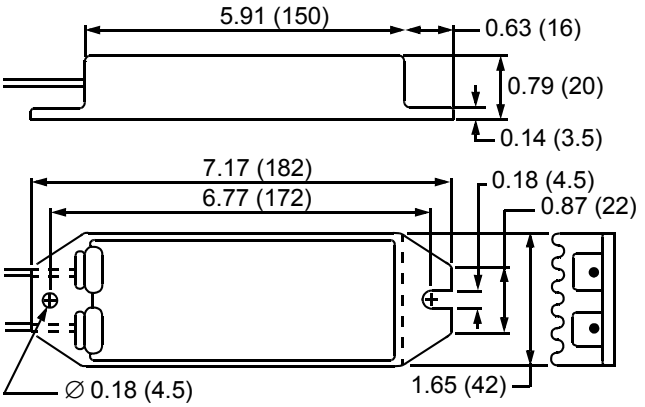
Consult Appendix E of the FSP Series Servo System User's Manual (No. YEA-SIA-FSP-3) for a more detailed description of the selection procedure.

Part# RH500N25_OHMK



Lead wire:L = 17.72 (450)
Rated power:300W
Resistance value:25Ω

Part# RH120 50OHM J



Lead wire:L = 11.81 (300)
Rated power:70W
Resistance value:50Ω

- **Regenerative Resistor Specifications**

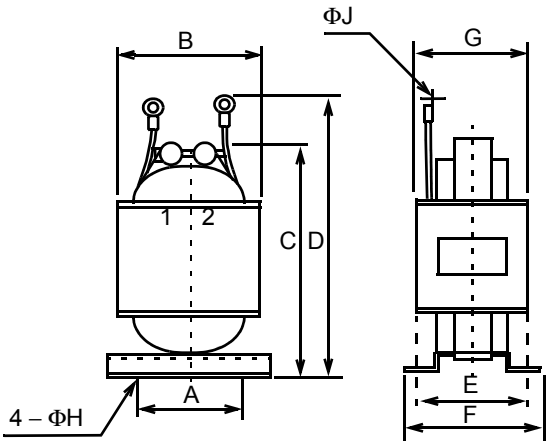
Tolerance	J: ±7%, K: ±10%
Temperature Characteristics	±260PPM/°C (20Ω or higher)
Withstand Voltage	ΔR at 2000V_{ac} applied for one minute: ±(0.1% + 0.05Ω)
Insulation Resistance	20MΩ or higher at 500VDC
Short-term Overload	ΔR with ten times the rated power applied for five seconds (±2% + 0.05Ω)
Service Life	ΔR in 1000 hours at rated power 90 minutes ON and 30 minutes OFF (±5% +0.05Ω)
Inflammability	Fire does not occur with 10 times the rated power applied for one minute.
Ambient Temperature Range	-25 to 150°C

Control of Harmonic Frequency in the Power Supply Circuit

If harmonic frequency control is needed in the power supply, connect a DC reactor between terminals (+) 1 and (+) 2 on the servo amplifier's main circuit. Use the following table as a guide for selection of the appropriate reactor.

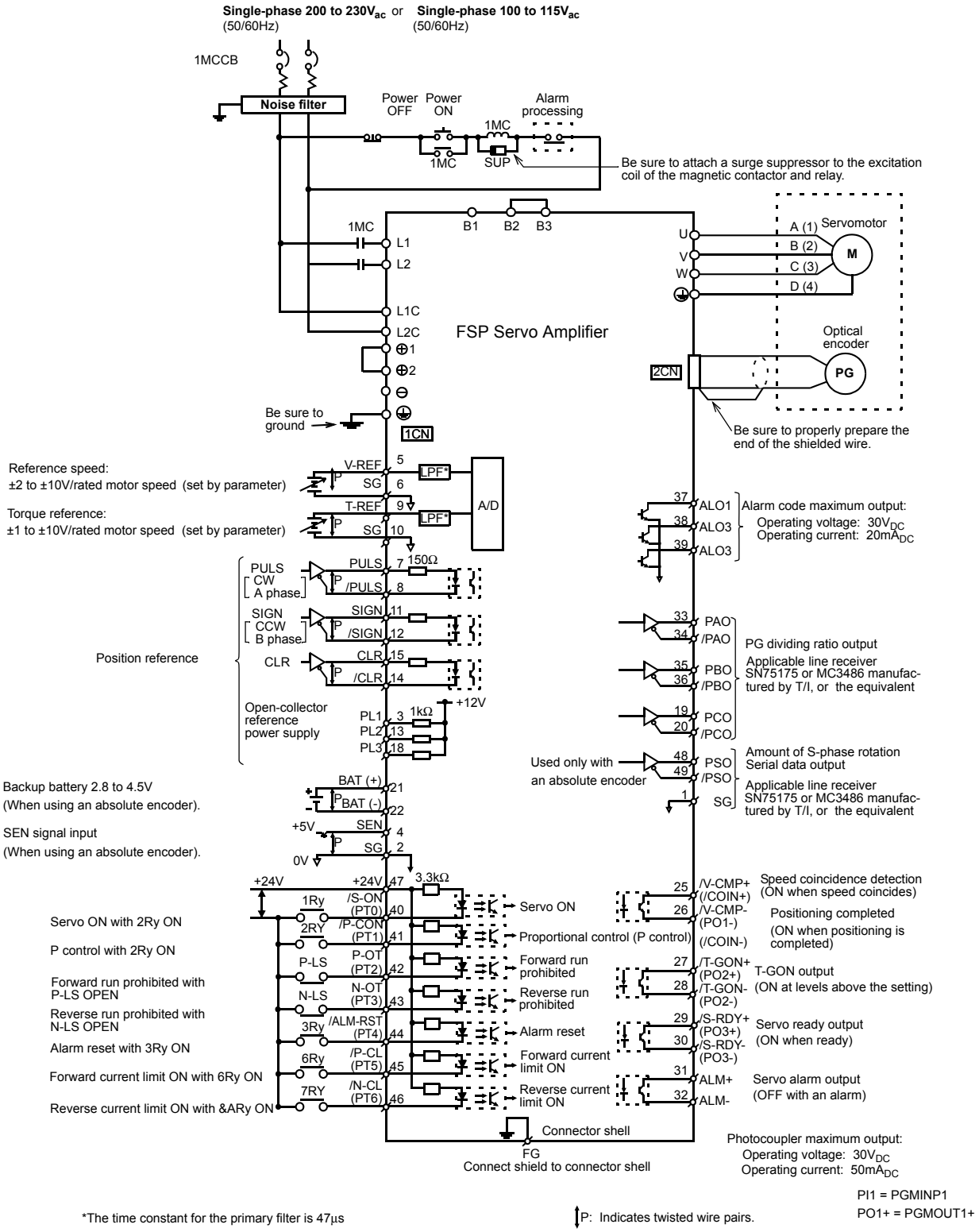
Applicable Servo Amplifier		Reactor Specifications		Reactor Model
		Impedance (mH)	Rated Current (A)	
100V	FSP-A3BMC	—	—	—
	FSP-A5BMC	—	—	—
	FSP-01BMC	10.0	1.8	X5063
	FSP-02BMC	4.7	3.5	X5062
200V	FSP-A3AMC	—	—	—
	FSP-A5AMC	—	—	—
	FSP-01AMC	40.0	0.85	X5071
	FSP-02AMC	20.0	1.65	X5070
	FSP-04AMC	10.0	3.3	X5069
	FSP-08AMC-S	4.0	5.3	X5079
	FSP-15AMC-S	2.5	10.5	X5078
	FSP-10AMC	2.0	4.8	X5061
	FSP-20AMC	1.5	8.8	X5060
	FSP-30AMC	1.0	14.0	X5059

- **DC Reactor Dimensional Drawings**

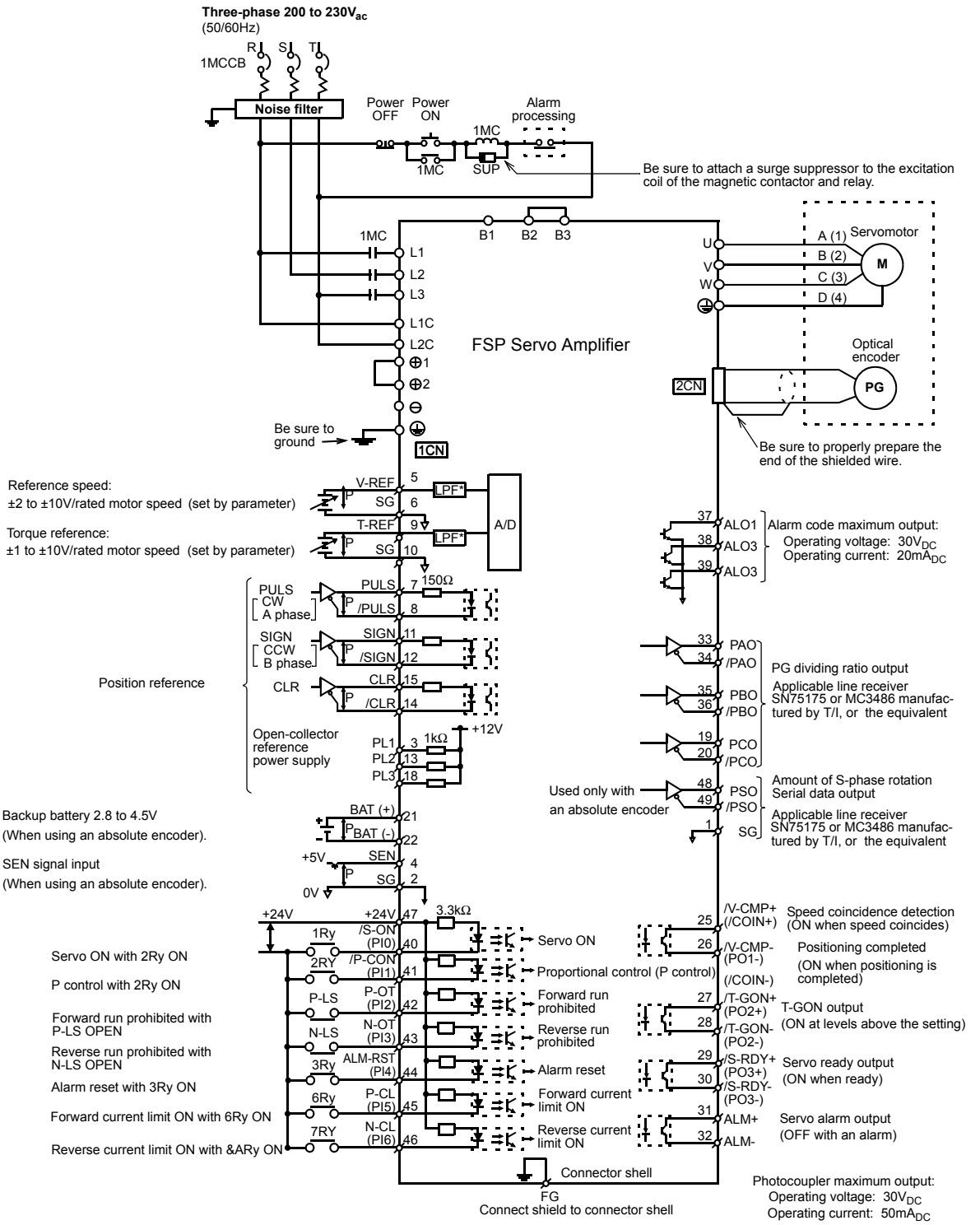


Reactor Model	Dimensions in (mm)									Approximate Mass lb (kg)
	A	B	C	D	E	F	G	ΦH	ΦJ	
X5063	1.38 (35)	2.05 (52)	3.54 (90)	4.13 (105)	1.38 (35)	1.77 (45)	1.97 (50)	0.16 (4)	0.17 (4.3)	1.323 (0.6)
X5062	1.57 (40)	2.32 (59)	3.94 (100)	4.72 (120)	1.57 (40)	1.97 (50)	2.17 (55)	0.16 (4)	0.17 (4.3)	1.984 (0.9)
X5061	1.38 (35)	2.05 (52)	3.15 (80)	3.73 (95)	1.38 (35)	1.77 (45)	1.97 (50)	0.16 (4)	0.17 (4.3)	1.102 (0.5)
X5060	1.57 (40)	2.32 (59)	4.13 (105)	4.92 (125)	1.77 (45)	2.36 (60)	2.56 (65)	0.16 (4)	0.17 (4.3)	2.21 (1.0)
X5059	1.97 (50)	2.91 (74)	4.92 (125)	5.51 (140)	1.38 (35)	1.77 (45)	2.36 (60)	0.20 (5)	0.21 (5.3)	2.43 (1.1)
X5068	1.97 (50)	2.91 (74)	4.92 (125)	6.1 (155)	2.09 (53)	2.6 (66)	2.95 (75)	0.20 (5)	0.25 (6.4)	4.19 (1.9)
X5069	1.25 (40)	2.32 (59)	4.13 (105)	4.92 125	1.77 45	2.36 60	2.56 65	0.16 4	0.21 5.3	2.205 (1.0)
X5070	1.57 (40)	2.32 (59)	3.94 (100)	4.72 (120)	1.38 (35)	1.77 (45)	1.97 (50)	0.16 (4)	0.17 (4.3)	1.764 (0.8)
X5071	1.38 (35)	2.05 (52)	3.15 (80)	3.74 (95)	1.18 (30)	1.57 (40)	1.77 (45)	0.16 (4)	0.17 (4.3)	1.102 (0.5)
X5078	1.97 (50)	2.91 (74)	4.92 (125)	6.1 (155)	2.36 (60)	2.76 (70)	3.15 (80)	0.20 (5)	0.21 (5.3)	4.41 (2.0)
X5079	1.97 (50)	2.91 (74)	4.92 (125)	5.51 (140)	1.38 (35)	1.77 (45)	2.36 (60)	0.20 (5)	0.17 (4.3)	2.65 (1.2)

Connection Diagram, Single-phase



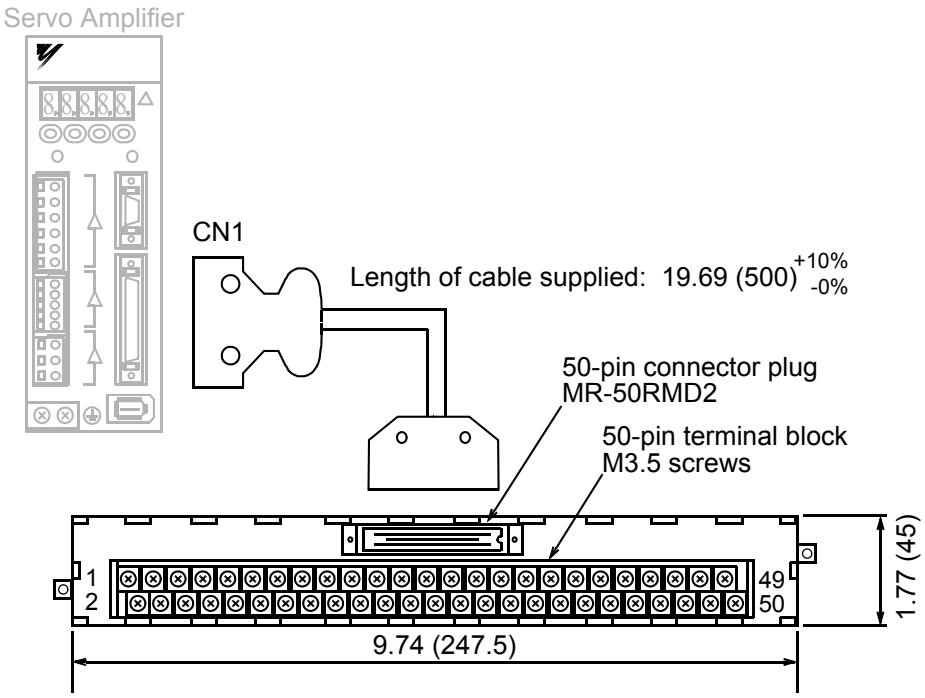
Connection Diagram, Three-phase



*The time constant for the primary filter is 47μs

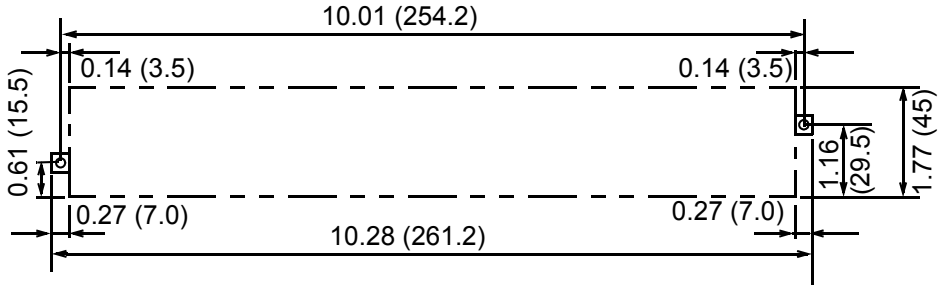
P: Indicates twisted wire pairs.

Connector Terminal Block Converter Unit JUSP-TA50P



Connector Terminal Block Converter Unit
JUSP-TA50P* (cable included)

Mounting Hole Diagram



*Terminal specifications : See the following page

JUSP-TA50P Terminal Block Pin Numbers and Signal Names

FSP Servo Amplifier				JUSP-TA50P Terminal Block Unit		
Signal Name*		CN1 Pin Number		Connector Number		Terminal Block Number
SG		1		A1		1
SG		2	P	B1		2
PL1		3		A2		3
SEN		4		B2		4
V-REF		5	P	A3		5
SG		6		B3		6
PULS		7	P	A4		7
/PULS		8		B4		8
T-REF		9	P	A5		9
SG		10		B5		10
SIGN		11	P	A6		11
/SIGN		12		B6		12
PL2		13		A7		13
/CLR		14	P	B7		14
CLR		15		A8		15
		16		B8		16
		17		A9		17
PL3		18		B9		18
PCO		19	P	A10		19
/PCO		20		B10		20
BAT (+)		21	P	A11		21
BAT (-)		22		B11		22
		23		A12		23
		24		B12		24
/V-CMP+		25	P	A13		25
/V-CMP- (PO1-)		26		B13		26
/TGON+ (PO2+)		27	P	A14		27
/TGON- (PO2-)		28		B14		28
/S-RDY+ (PO3+)		29	P	A15		29
/S-RDY- (PO3-)		30		B15		30
ALM+		31	P	A16		31
ALM-		32		B16		32
PAO		33	P	A17		33
/PAO		34		B17		34
BPO		35	P	A18		35
/PBO		36		B18		36
ALO1		37		A19		37
ALO2		38		B19		38
ALO3		39		A20		39
/S-ON (PI0)		40		B20		40
/P-CON (PI1)		41		A21		41
P-OT (PI2)		42		B21		42
N-OT (PI3)		43		A22		43
/ALM-RST (PI4)		44		B22		44
/P-CL (PI5)		45		A23		45
/N-CL (PI6)		46		B23		46
+24V IN		47		A24		47
PSO		48	P	B24		48
/PSO		49		A25		49
		50		B25		50
Connector Case						

Cable: Supplied with the terminal block

P: Indicates twisted pair wires.

*Preconfigured amplifier inputs and outputs are listed above as they are designated when the unit is shipped from the factory. Use the connection diagrams on the previous pages for more functional details.

Cable Specifications and Peripheral Devices

Ratings and specifications for peripheral devices, as well as cable specifications for servo amplifiers are summarized in the tables below.

⚠ CAUTION

Wiring Precautions

- **Do not bundle or run power and signal lines together in the same duct.**
  Keep power and signal lines at least 11.81" (30cm) apart.
- **Use twisted pair or shielded multi-core twisted pair wires for signal and encoder (PG) feedback lines.**
- **The maximum lengths for signal lines are as follows:**
  - Maximum of 9.84ft (300cm) for reference input lines.
  - Maximum of 65.6ft (20m) for PG feedback lines.
  - Use a cable with 164 ft (50m) specifications for distances over 65.6ft (20m).

Cable Specifications

The following tables provide wire size specifications:

External Terminal Name		FSP Terminal Symbol	Wire Size AWG [in^2 (mm^2)]				
			A3A□□	A5A□□	01A□□	02A□□	04A□□
200V	Main circuit power input terminals	L1, L2 (Single Phase)	16 AWG [HIV 0.002 (1.25)]				14 AWG [0.003 (2.0)]
	Servomotor connection terminals	U, V, W	16 AWG [HIV 0.002 (1.25)]				
	Control power supply terminals	L1C, L2C					
	Control I/O signal connector	CN1	Twisted pair or shielded twisted pair wires Core wire at least 28 AWG [0.0002 (0.12)], tinned, annealed copper twisted wires Finished cable dimensions: maximum Φ0.63in (16mm) for CN1 and Φ0.27in (6.8mm) for CN2.				
	PG signal connector	CN2					
	Ground terminal	⏚	14 AWG [HIV 0.003 (2.0)]				

External Terminal Name		FSP Terminal Symbol	Wire Size AWG [in^2 (mm^2)]	
			08A□□-S	15A□□-S
200V	Main circuit power input terminals	L1, L2 (Single Phase)	14 AWG [0.003 (2.0)]	12 AWG [0.0054 (3.5)]
	Servomotor connection terminals	U, V, W		
	Control power supply terminals	L1C, L2C	16 AWG [HIV 0.002 (1.25)]	14 AWG [0.003 (2.0)]
	Control I/O signal connector	CN1	Twisted pair or shielded twisted pair wires Core wire at least 28 AWG [0.0002 (0.12)], tinned, annealed copper twisted wires Finished cable dimensions: maximum Φ0.63in (16mm) for CN1 and Φ0.27in (6.8mm) for CN2.	
	PG signal connector	CN2		
	Ground terminal	⏚	14 AWG [HIV 0.003 (2.0)]	

Cable Specifications (cont'd)

External Terminal Name		FSP Terminal Symbol	Wire Size AWG [in^2 (mm^2)]		
			10A□□	20A□□	30A□□
200V	Main circuit power input terminals	L1, L2, L3 (Three-phase)	14 AWG [HIV 0.003 (2.0)]	12 AWG [HIV 0.005 (3.5)]	
	Servomotor connection terminals	U, V, W			
	Control power supply terminals	L1C, L2C	16 AWG [HIV 0.002 (1.25)]		
	Control I/O signal connector	CN1	Twisted pair or shielded twisted pair wires Core wire at least 28 AWG [0.0002 (0.12)], tinned, annealed copper twisted wires. See page 113 for details. Finished cable dimensions: maximum Φ0.63in (16mm) for CN1 and Φ0.27in (6.8mm) for CN2.		
	PG signal connector	CN2			
	Ground terminal	⏚	14 AWG [HIV 0.003 (2.0)]		

External Terminal Name		FSP Terminal Symbol	Wire Size AWG [in^2 (mm^2)]			
			A3B□□	A5B□□	01B□□	02B□□
100V	Main circuit power input terminals	L1, L2 (Single Phase)	16 AWG [HIV 0.002 (1.25)]			14 AWG [0.003 (2.0)]
	Servomotor connection terminals	U, V, W	16 AWG [HIV 0.002 (1.25)]			
	Control power supply terminals	L1C, L2C				
	Control I/O signal connector	CN1	Twisted pair or shielded twisted pair wires Core wire at least 28 AWG [0.0002 (0.12)], tinned, annealed copper twisted wires. See page 113 for details. Finished cable dimensions: maximum Φ0.63in (16mm) for CN1 and Φ0.27in (6.8mm) for CN2.			
	PG signal connector	CN2				
	Ground terminal	⏚	14 AWG [HIV 0.003 (2.0)]			

Notes:
1. Wire sizes were selected for three cables per bundle at 40°C ambient temperature with the rated current.
2. Use cables with a minimum withstand voltage of 600V for main circuits.
3. If cables are bundled in PVC or metal ducts, consider the reduction ratio of the allowable current.
4. Use heat-resistant cable under high ambient or panel temperatures where normal vinyl cable will rapidly deteriorate.

The following table shows types of cables. It is used in conjunction with the preceding tables.

Cable Type		Temperature Rating of Conductor °C
Name	Composition	
PVC	Standard polyvinyl chloride cable	—
IV	600V PVC cable	60
HIV	Temperature-resistant vinyl cable	75

The following table specifies the appropriate cables for CN1 and CN2 servo amplifier connectors.

Wire sizes were selected with the expectation of three cables per bundle, at an ambient temperature of 40°C, at the rated current level.

Connector Name	Signal	Description	Specification
Control I/O Signal Connector	CN1	Cable	Use twisted pair or shielded twisted pair wire.
		Applicable wire	(AWG): 24, 26, 28
		Finished cable Dimension	Φ0.63 (Φ16.0) maximum
PG Signal Connector	CN2	Cable	Use encoder cable manufactured by Yaskawa when interfacing with Yaskawa motors.

Peripheral Device Types and Capacities

Main Circuit Power Supply	Amplifier Model		Control Power Required (W)	Power Supply				Recommended Noise Filter**		Motor Magnetic Contactor
	Capacity (kW)	FSP-		Capacity per Servo Amplifier (kVA)	Rated Main Power (A_{rms})	Maximum Inrush Current (A_{rms})	MCCB or Fuse Capacity* (A_{rms})	Model	Specifications	
Single-phase 100V	0.03	A3BMC	13	0.15	1.1	28	4	Fn2070-6/07 (or FS5827-4-07)	Single-phase $250V_{ac}$ 6A (4A)	(10A) or equivalent
	0.05	A5BMC		0.25	1.8					
	0.10	01BMC		0.40	2.0					
	0.20	02BMC		0.60	5.2		6	Fn2070-10/07	Single-phase $250V_{ac}$ 10A	
Single-phase 200V	0.03	A3AMC		0.20	0.82		4	Fn2070-6/07 (or FS5827-4-07)	Single-phase $250V_{ac}$ 6A (4A)	
	0.05	A5AMC		0.25	1.1					
	0.10	01AMC		0.40	2.0					
	0.20	02AMC		0.75	3.4					
	0.40	04AMC		1.2	5.5		8	Fn2070-10/07 (or FS5827-7-07)	Single-phase $250V_{ac}$ 10A (7A)	(20A) or equivalent
	0.75	08AMC-S	15	2.1	11.0		11	Fn2070-16/07 (or FS5827-15-07)	Single-phase $250V_{ac}$ 16A (15A)	
	1.5	15AMC-S		4.0	19.0		19	Fn350-30/33 (or FS5827-25-07)	Single-phase $250V_{ac}$ 30A (25A)	35A or equivalent
Three-phase 200V	1.0	10AMC		2.3	7.0		7	Fn258L-16/07	Three-phase $480V_{ac}$ 16A	(20A) or equivalent
	2.0	20AMC		4.3	12.0	56	13			(35A) or equivalent
	3.0	30AMC		5.9	17.0		17	Fn258L-30/07	Three-phase $480V_{ac}$ 30A	

* Size per local code requirements. Typical fuse interrupting characteristics at 25°C: 200% for 2s minimum; 700% for 0.01s minimum.

** The Fn□□□□ noise filter is manufactured by Schaffner Corporation. Specifications are available at: www.schaffner.com.

Peripheral Device Manufacturers

J.S.T. Corporation
1957 South Lakeside Drive
Waukegan, Illinois 60085

Phone: (847) 473-1957
http://www.jst.com

TDK Corporation of America
1600 Feehanville Dr.
Mount Prospect, Illinois 60056

Phone: (847) 803-6100
Fax: (847) 803-6296

Schaffner EMC Inc.
52 Mayfield Ave.
Edison, New Jersey 08837

Phone: 1-800 367-5566
(732) 225-9533
Fax: (732) 225-4789
http://www.shaffner.com

Tokin America
32950 Alvarado-Niles Rd.
Suite 500
Union City, California 94507

Phone: (510) 324-4110
Fax: (510) 324-1762
http://www.tokin.com

Table of Contents

General Purpose

SGMGH Servomotors - With Incremental / Absolute Encoder

Rated Output: 0.45kW, 0.85kW, 1.3kW, 1.8kW, 2.9kW, 4.4kW

For Additional Information	Page(s)
SGMGH Ratings & Specifications	116
SGMGH Speed/Torque Curves	117
SGMGH Dimensions	118 - 119
SGMGH Selection/Ordering Information	120 - 126
FSP (400V) Ratings & Specifications	141 - 146
FSP Dimensions	149 - 153

Design Features

1. **Compact**
   - Small sized motor
     - Compatible with previous generation G series motors
     - Ten types of rated outputs ranging from 0.79 to 1988in • lb of peak torque
     - Optional built-in holding brake available
2. **Higher Speed and acceleration**
   - Up to 3000rpm maximum
   - High torque to inertia ratio
3. **Encoders**
   - 17-bit (32,768 ppr x 4) incremental encoder (standard)
   - 17-bit absolute encoder (optional)
4. **Enhanced Environmental Resistance**
   - Totally enclosed, self-cooled IP67 (excluding shaft)
   - Shaft seal (optional)
5. **Application Emphasis**
   - Machine tools and woodworking machines
   - Packaging machines
   - Gantry robots
   - Press automation
   - Thermoforming
6. **Certified International Standards**
   - UL, cUL recognized (File #: E165827) CE compliance

Servomotor Ratings and Specifications

Time Rating: Continuous
Insulation: Class F
Vibration: 15μm or less
Withstand Voltage: $1500V_{ac}$
Insulation Resistance: $10M\Omega$ minimum at $500V_{DC}$

Enclosure: Totally-enclosed, self-cooled IP67 (except for shaft opening)
Ambient Temperature: 0 to 40ºC
Ambient Humidity: 20 to 80% (non-condensing)
Rated Speed*: 1500rpm

Maximum Rotational Speed*:
0.45 to 7.5kW: 3000rpm
11 and 15kW: 2000rpm
Excitation: Permanent magnet
Drive Method: Direct drive
Mounting: Flange-mounted

* Values when the servomotor is combined with an FSP servo amplifier.

Amplifier System Voltage	MOTORS: SGMGH-	Rated Output*	Rated Torque*		Instantaneous Peak Torque*		Rated Current*	Instantaneous Maximum Current*
		kW (hp)	N • m	lb_f • in (KG • cm)	N • m	lb_f • in (KG • cm)	A_{rms}	A_{rms}
$400V_{ac}$	05D□A	0.45 (0.6)	2.84	25 (29)	8.92	79 (91)	1.9	5.5
	09D□A	0.85 (1.1)	5.39	48 (55)	13.8	122 (141)	3.5	8.5
	13D□A	1.3 (1.7)	8.34	74 (85)	23.3	207 (238)	5.4	14.0
	20D□A	1.8 (2.4)	11.5	102 (117)	28.7	254 (293)	8.4	20.0
	30D□A	2.9 (3.9)	18.6	165 (190)	45.1	400 (460)	11.9	28.0
	44D□A	4.4 (5.9)	28.4	252 (290)	71.1	630 (725)	16.4	40.5

* Values when the servomotor is combined with an FSP servo amplifier.

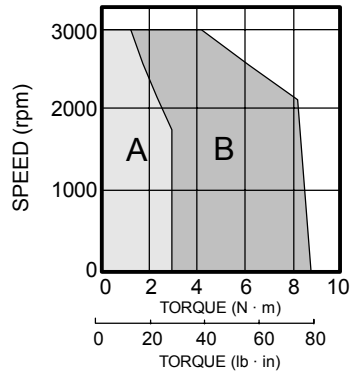
MOTORS SGMGH-	Torque Constant	Moment of Inertia		Holding Brake (at 20°C)					Allowable Load Inertia	Rated Power Rate*	Rated Angular Acceleration*	Inertia Time Constant	Inductive Time Constant
				Capacity	Torque	Coil. Resistance	Rated Current	Additional Inertia					
	$\frac{lb_f \cdot in}{A_{rms}}$ $(\frac{N \cdot m}{A_{rms}})$	$lb \cdot in \cdot s^2 \times 10^{-3}$	$KG \cdot m^2 \times 10^{-4}$	W	N • m	Ω	A	$lb \cdot in \cdot s^2 \times 10^{-3}$	$KG \cdot m^2 \times 10^{-4}$	kW/s	rad/s^2	ms	ms
05D□A	14.5 (1.64)	6.42	7.24	9.85	4.41	58.7	0.41	1.85	36.2	11.2	3930	5.6	4.5
09D□A	14.6 (1.65)	12.3	13.9		12.7				69.5	20.9	3880	3.1	5.3
13D□A	14.9 (1.68)	18.2	20.5						103	33.8	4060	2.9	6.1
20D□A	12.9 (1.46)	28.1	31.7	18.5	43.1	31.1	0.77	7.75	159	41.5	3620	2.4	11.1
30D□A	14.7 (1.66)	40.7	46.0						230	75.3	4050	2.0	12.3
44D□A	16.0 (1.82)	59.8	67.5						338	120	4210	1.4	15.2

* Values when the servomotor is combined with an FSP servo amplifier at an armature winding temperature of 20°C.
** These characteristics can be obtained when the following heat sinks (steel plates) are used for cooling purposes:
Type 05D□A to 13D□A: $15.75 \times 15.75 \times 0.79$ (in) ($400 \times 400 \times 20$ (mm))
Type 20D□A to 44D□A: $21.65 \times 21.65 \times 1.18$ (in) ($550 \times 550 \times 30$ (mm))

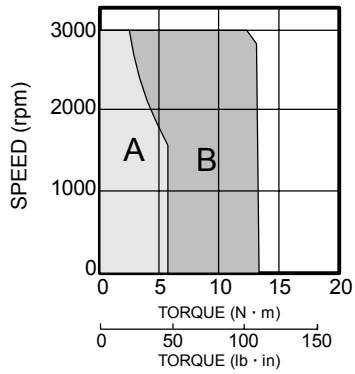
Speed / Torque Curves

400V

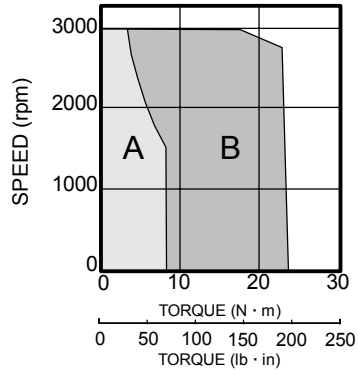
SGMGH-05D□A



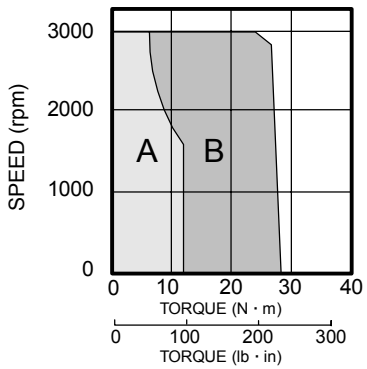
SGMGH-09D□A



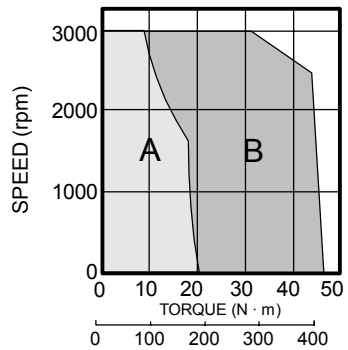
SGMGH-13D□A



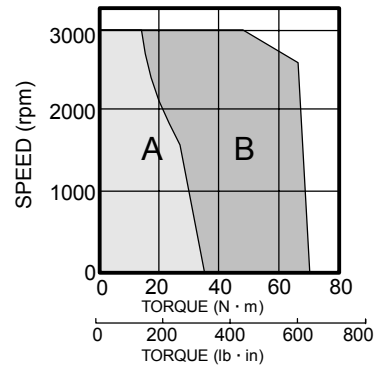
SGMGH-20D□A



SGMGH-30D□A



SGMGH-44D□A

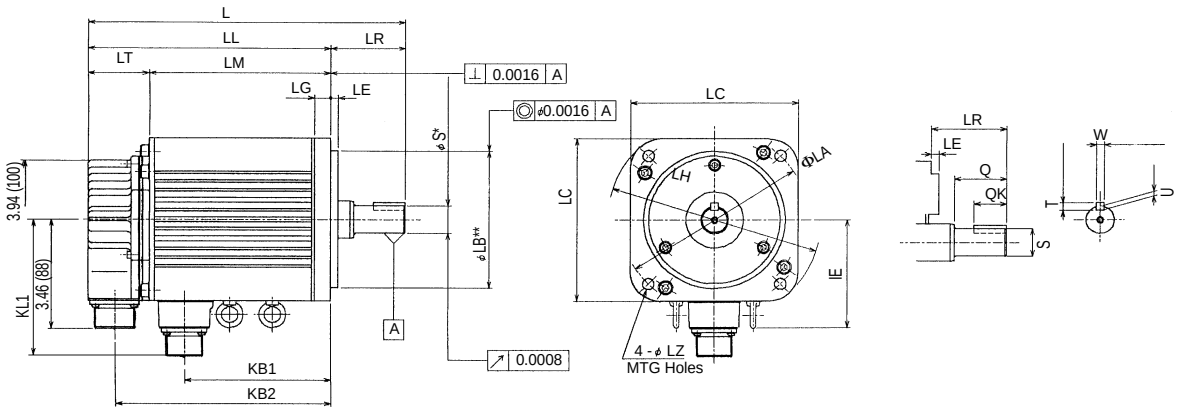


A : CONTINUOUS DUTY ZONE

B : INTERMITTENT DUTY ZONE

Dimensions in inches (mm)

(1) 17-Bit Incremental/Absolute Encoder

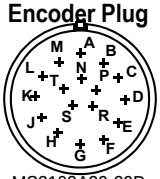


Type SGMGH-	L	LL	LM	LR	LT	KB1	KB2	IE	KL1	Flange Dimensions							Shaft End Dimension						Approximate Mass lbf (kg)	Allowable Radial Load lbf (N)	Allowable Thrust Load lbf (N)
										ΦLA	ΦLB**	LC	LE	LG	ΦLH	ΦLZ	ΦS*	Q	QK	W	T	U			
05D□A61	7.72 (196)	5.43 (138)	3.62 (92)	2.28 (58)	1.81 (46)	2.56 (65)	4.61 (117)	—	4.29 (109)	5.71 (145)	4.33 (110)	5.12 (130)	0.24 (6)	0.47 (12)	6.5 (165)	0.35 (9)	0.75 (19)	1.57 (40)	0.98 (25)	0.20 (5)	0.20 (5)	0.12 (3)	12.1 (5.5)	110 (490)	22 (98)
09D□A61	8.62 (219)	6.34 (161)	4.53 (115)			3.46 (88)	5.51 (140)																16.8 (7.6)		
13D□A61	9.57 (243)	7.28 (185)	5.47 (139)			4.41 (112)	6.46 (164)										0.87 (22)			0.24 (6)	0.24 (6)	0.14 (3.5)	21.2 (9.6)	154 (686)	77 (343)
20D□A61	9.65 (245)	6.54 (166)	4.69 (119)	3.11 (79)	1.85 (47)	3.5 (89)	5.71 (145)		5.51 (140)	7.87 (200)	4.5 (114.3)	7.09 (180)	0.13 (3.2)	0.71 (18)	9.06 (230)	0.53 (13.5)	1.38 (35)	2.99 (76)	2.36 (60)	0.39 (10)	0.31 (8)	0.20 (5)	30.9 (14)	265 (1176)	110 (490)
30D□A61	10.67 (271)	7.56 (192)	5.71 (145)			4.53 (115)	6.73 (171)																39.7 (18)	331 (1470)	
44D□A61	12.01 (305)	8.9 (226)	7.05 (179)			5.87 (149)	8.07 (205)																50.7 (23)		

Note: 1. SGMGH-05D□A to 44D□A do not contain eyebolts.
2. Dimensions are the same when using either incremental or absolute encoders (with or without optional shaft seal).
3. Tolerances on the dimensions of flange type LB and of shaft extensions S are based on JIS (Japanese Industrial Standard) B0401 "Limits and Fits for Engineering."

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.7480, 0.8661	+0.0000-0.0005	4.3307	+0.0000 -0.0014
	1.3780	+0.0004-0.0000	4.5000	+0.0000 -0.0010
	1.6535	+0.0000 -0.0006		
	2.1700	+0.0012+0.0004	7.8700	+0.0000 -0.0018
mm	19.000, 22.000	+0.000 -0.013	110.000	+0.000 -0.035
	35.000	+0.010 -0.000	114.300	+0.000 -0.025
	42.000	+0.000 -0.016		
	55.000	+0.030 +0.011	200.000	+0.0000 -0.046

Encoder Plug

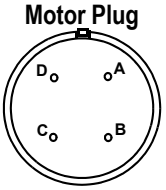


MS3102A20-29P

Connector Wiring on the Encoders			
A	—	K	—
B	—	L	—
C	Data +	M	—
D	Data -	N	—
E	—	P	—
F	—	R	—
G	0V	S	Battery – (Note*)
H	+5V_{dc}	T	Battery + (Note*)
J	FG (Frame Ground)	*Note: Used with an absolute encoder only.	

Non-Environmental Mating Connector:
MS3108B20-29S (L Type)
MS3106B20-29S (Straight Type)
Cable Clamp: MS3057-12A

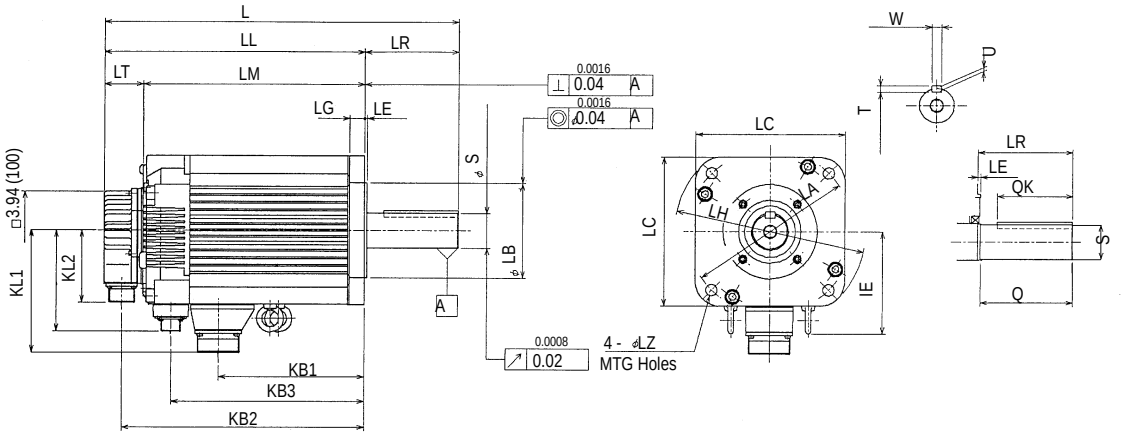
Motor Plug



Connector Wiring on the Motor Side	
A	U Phase
B	V Phase
C	W Phase
D	Ground Terminal

(2) 17-Bit Incremental/Absolute Encoder, With Brake

- **0.5 to 4.4kW (0.7 to 5.9hp)**

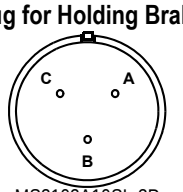


Type SGMGH-	L	LL	LM	LR	LT	KB1	KB2	KB3	KL1	KL2	Flange Dimensions							Shaft End Dimension						Approximate Mass lb$_f$ (kg)	Allowable Radial Load lb$_f$ (N)	Allowable Thrust Load lb$_f$ (N)
											ΦLA	ΦLB**	LC	LE	LG	LH	ΦLZ	ΦS*	Q	QK	W	T	U			
05D□A6C	9.21 (234)	6.93 (176)	5.08 (129)	2.28 (58)	1.85 (47)	2.56 (65)	6.1 (155)	4.29 (109)	4.29 (109)	3.46 (88)	5.71 (145)	4.33 (110)	5.12 (130)	0.24 (6)	0.47 (12)	6.5 (165)	0.35 (9)	0.75 (19)	1.57 (40)	0.98 (25)	0.20 (5)	0.20 (5)	0.12 (3)	16.5 (7.5)	110 (490)	22 (98)
09D□A6C	10.12 (257)	7.83 (199)	5.98 (152)			3.46 (88)	7.01 (178)	5.20 (132)																21.2 (9.6)		
13D□A6C	11.06 (281)	8.78 (223)	6.93 (176)			4.41 (112)	7.95 (202)	6.14 (156)										0.87 (22)			0.24 (6)	0.24 (6)	0.14 (3.5)	26.5 (12)	154 686)	77 (343)
20D□A6C	11.65 (296)	8.54 (217)	6.69 (170)	3.11 (79)		3.50 (89)	7.72 (196)	5.39 (137)	5.51 (140)		7.87 (200)	4.5 (114.3)	7.09 (180)	0.13 (3.2)	0.71 (18)	9.06 (230)	0.53 (13.5)	1.38 (35)	2.99 (76)	2.36 (60)	0.39 (10)	0.31 (8)	0.20 (5)	41.9 (19)	265 (1176)	110 (490)
30D□A6C	12.68 (322)	9.57 (243)	7.72 (196)			4.53 (115)	8.74 (222)	6.42 (163)																51.8 (23.5)	331 (1470)	
44D□A6C	14.02 (356)	10.91 (277)	9.06 (230)			5.87 (149)	10.08 (256)	7.72 (196)																62.8 (28.5)		

Note: 1. Dimensions are the same when using other incremental encoders (with or without optional shaft seal)..
2. Tolerances on the dimensions LB of flange type and S of shaft extensions are based on JIS (Japanese Industrial Standard) B0401 "Limits and Fits for Engineering."

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.7480, 0.8661	+0.0000-0.0005	4.3307	+0.0000 -0.0014
	1.3780	+0.0004-0.0000	4.5000	+0.0000 -0.0010
mm	19.000, 22.000	+0.000 -0.013	110.000	+0.000 -0.035
	35.000	+0.010 -0.000	114.300	+0.000 -0.025

Plug for Holding Brake

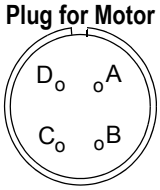


MS3102A10SL-3P

Connector Wiring on the Brake, Motor Side	
A	Brake Terminal
B	Brake Terminal
C	—

Non-Environmental Mating Connector:
MS3108A10SL-3S (L Type)
Cable Clamp: MS3057-4A

Plug for Motor

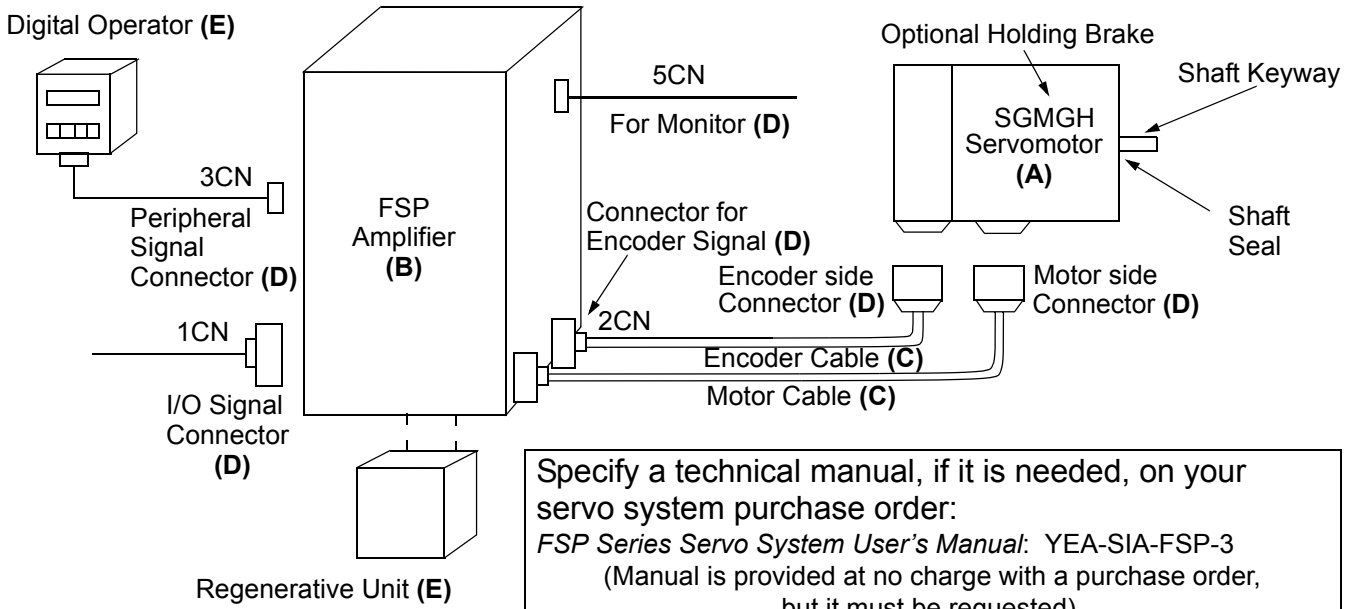


Connector Wiring on the Motor Side	
A	U Phase
B	V Phase
C	W Phase
D	FG (Frame Ground)

Selecting: SGMGH Sigma II Servo System

First, select the Sigma II servomotor suited for your application using SigmaSize: The Yaskawa servomotor sizing software, available at www.yaskawa.com. (You may also request SigmaSize software via e-mail, at: literature@yaskawa.com).
Use the diagram below to locate and identify the components of your system. Each item is letter-coded and cross-referenced in the option tables on the following pages.

System Configuration



Specify a technical manual, if it is needed, on your servo system purchase order:
FSP Series Servo System User's Manual: YEA-SIA-FSP-3
(Manual is provided at no charge with a purchase order, but it must be requested).

Model Number Designation

SGMGH - 09 D C A 6 C

Sigma Servomotor Type

Rated Output
- 05: 500W (0.7hp)
- 09: 850W (1.14hp)
- 13: 1.3kW (1.7hp)
- 20: 2.0kW (2.7hp)
- 30: 3.0kW (4.0hp)
- 44: 4.4kW (6.0hp)

Power Supply
- D: 400V

Accessories
- 1: Standard
- C: $24V_{DC}$ Brake
- S: Shaft Seal
- E: Brake and Shaft Seal

Shaft Specifications
- 6: Straight Shaft with Keyway

Rated Speed
- A: 1500rpm

Encoder Specifications
- C: 17-Bit Incremental Encoder
- 2: 17-Bit Absolute Encoder

Servomotor & Amplifier Selection

Use the table below to select the appropriate SGMGH Sigma II servomotor and amplifier.
(Refer to the motor model # designation on the previous page specifying the available modification to motor construction/features.)

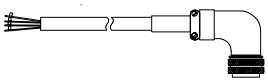
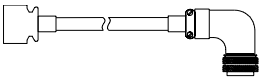
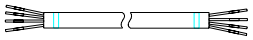
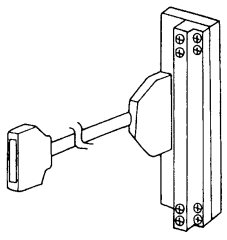
Description	Peak Torque (in • lb)	Rated Torque (in • lb)	Motor Inertia (in • lb • s^2 x 10^{-3})	Motor MODEL Number **(A)**	Amplifier MODEL # **(B)*** Analog/Digital Input FSP-	Motor and Amplifier Item Class
400V Three-Phase 17-bit Incremental Encoder Straight Shaft with Keyway 3000rpm maximum MS Connectors	79	25	6.41	SGMGH-05DCA61	05DMC	Stock
			8.26	SGMGH-05DCA6C		
	122	48	12.30	SGMGH-09DCA61	10DMC	
			14.15	SGMGH-09DCA6C		
	207	74	18.2	SGMGH-13DCA61	15DMC	
			20.1	SGMGH-13DCA6C		
	254	102	28.1	SGMGH-20DCA61	20DMC	
			35.9	SGMGH-20DCA6C		
	404	165	40.7	SGMGH-30DCA61	30DMC	
			48.5	SGMGH-30DCA6C		
	629	252	59.8	SGMGH-44DCA61	30DMC	
			67.6	SGMGH-44DCA6C		

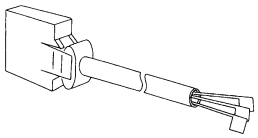
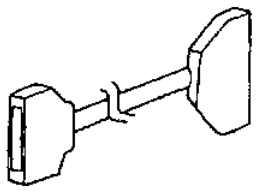
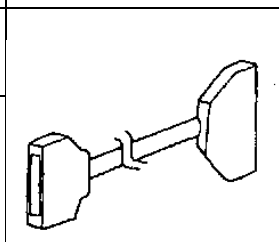
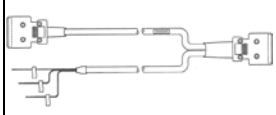
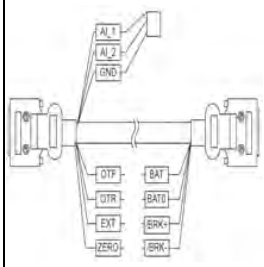
Note: $24V_{DC}$ brakes for SGMGH Sigma II servomotors are standard. Contact a local source for $24V_{DC}$ power supplies. For technical information, request Yaskawa manual number YEA-SIA-FSP-3.

* For more detailed FSP amplifier specifications and dimensions, refer to page 143 - 148.

Pre-wired Cable Selection

Use the table below to select pre-wired cables for your SGMGH Sigma II servomotor.

Cable Description **(C)**		Motor Size (kW)	Part Number*	Comments	Item Class
Power Cable with Connectors (IP67)		0.5, 0.9, 1.3	BAE-□□(A)	Use the following key to specify needed cable length (last two digits of the part number): 03: 3m 05: 5m 10: 10m (standard) 15: 15m 20: 20m	Stock**
		2.0, 3.0, 4.4	BBE-□□(A)		
Power Cable for Holding Brake (IP67)		All	B7BCE-□□(A)		
Encoder Cable (incremental or absolute) (IP67)			AFGHCE-□□(A)		
Encoder feedback adapter cable for incremental and absolute*****	–		AFAD-P2(A)	Connects these full length encoder feedback cables to the FSP amplifier (Encoder feedback cables for SGDH amp) JZSP-CMP00-XX(A) A1ICE-XX(A) JZSP-CMP02-XX(B) 0.2 meter length	
Encoder feedback adapter cable for absolute encoders. Cable has built in absolute encoder battery and case.	–		AFADABS-P2(A)	Connects these full length encoder feedback cables to the FSP amplifier (Encoder feedback cables for SGDH amp) JZSP-CMP00-XX(A) A1ICE-XX(A) JZSP-CMP02-XX(B) Built-in battery is: JZSP-BA01 0.2 meter length	
Encoder Cable (for applications up to 20m) Only for Solder Connections			FR-RMCT-SB	These cables are available in any length. For example, to order one FR-RMCT-SB cable, 16m long, specify: quantity: 16 part no.: FR-RMCT-SB	
Encoder Cable (for applications from >20 to <50m) Only for Solder Connections			UL20276-SB		
Input/Output 1CN Cable & Transition Terminal Block			JUSP-TA50P	35mm DIN rail mountable; the cable length is 0.5 meters.	
			JUSP–WA50P–□□	35mm DIN Rail mountable D50: 0.5 meters (standard) 01: 1 meter (standard) 02: 2 meters 03: 3 meters	

Cable Description **(C)**		Motor Size (kW)	Part Number*	Comments	Item Class
Input/Output 1CN Cable with Pigtail Leads			JZSP-CKI01-□(A)	Use the following key to specify needed cable length (last digit of part number): 1: 1m (standard) 2: 2m 3: 3m	Stock**
Input/Output 1CN Cable Cable with Female D-Sub output Connector***			JZSP-CKI0D-□□	Use the following key to specify required cable length (last two digits of the part number): D50: 0.5m 01: 1m (standard) 02: 2m 03: 3m	
Input/Output 1CN SMC4000 to FSP Interface Cable		All	SMCCBL2□□	Use the following key to determine the desired length specification. □□= 02: 2 Feet 05: 5 Feet 10: 10 Feet 15: 15 Feet	
Input/Output 1CN SMC4000 to FSP Interface Cable with prepared alarm and reset inputs. requires jumper in SMC4000			SMCCBLH□□		
Input/Output 1CN SMC4000 to FSP Interface Cable with flying leads for additional amplifier I/O			SMCCBLB□□		Limited Stock
Input/Output 1CN MP2000 series controller to FSP Interface Cable			JEPMC–W2040–□□	Use the following key to determine the desired length specification. □□= A5: 0.5 meters 01: 1 meter 03: 3 meters	

* (A)" at the end of the cable number is the revision level. The revision level may be changed prior to this catalog's reprinting.

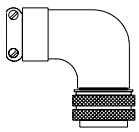
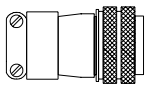
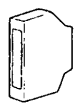
** Standard cable lengths are Stock items; non-standard cable lengths are Limited Stock items.

*** 50 Pin Female D-Sub output connector mates to customer supplied third party terminal block. (e.g., Wago #289-449, Weidmuller #919658, Phoenix #2283647, Amphenol/Sine #20-51039, and many others).

**** For systems using the absolute encoder and this part number, the absolute encoder battery must be connected at the amplifier 1CN connector.

Connector Selection

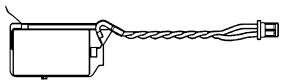
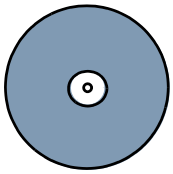
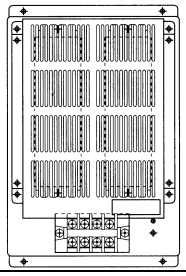
Use the table below to select mating connectors for each SGMGH Sigma II servomotor.

Connector Description **(D)**		Motor Size (kW)	Part Number	Comments	Item Class
MS Connector for Motor Power Cable*		0.5, 0.9, 1.3	MS3106B18-10S	Straight-type connector	Stock
			MS3108B18-10S	L-type connector	
			MS3057-10A	Cable clamp	
		2.0, 3.0, 4.4	MS3106B22-22S	Straight-type connector	
			MS3108B22-22S	L-type connector	
			MS3057-12A	Cable clamp	
MS Connector for Brake Power Cable		All	MS3108A10SL-3S MS3057-4A	L-type connector Cable clamp	
MS Connector for Encoder Cable (incremental or absolute encoder)			MS3106B20-29S	Straight-type connector	
			MS3108B20-29S	L-type connector	
			MS3057-12A	Cable clamp	
1CN Mating Connector			JZSP-CKI9	—	
2CN Amplifier Mating Connector			DE9406973*	—	
3CN Peripheral Mating Connector	—		YSC-1	—	
5CN Connector and 1m Cable with Pigtails	—		DE9404559	Can use 5CN for analog speed and torque monitor service checks.	

* Alternative part number is DTCR6973

Peripheral Device Selection

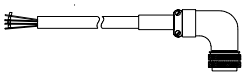
Use the table below to select peripheral devices for each SGMGH Sigma II servomotor.

Component **(E)**		Part Number	Description	Item Class
Software Interface Cable	—	YS-12	Pre-wired 2.0m cable with 9-pin connector	Stock
Absolute Encoder Battery		JZSP-BA01-1	3.6V, 1000mAh (lithium battery) with 5cm leads for wiring to 1CN	
		JZSP-BA01	3.6V, 1000mAh (Lithium Battery) replacement battery for use in absolute adapter cable AFADABS-P2(A)	
Flexworks		FSPGUI1 or download at www.yaskawa.com	–	
External Regenerative Unit (Optional)		JUSP-RA04	These are general purpose regenerative units.* Order the Motion document: PI#99004 for setup instructions for this unit. **Caution:** Proper setup is necessary to avoid equipment damage.	
DC Reactor (for suppressing harmonics in the power supply)	For 400V: FSP-05DMC	X5074	—	Limited Stock
	For 400V: FSP-10DMC FSP-15DMC	X5075		
	For 400V: FSP-20DMC FSP-30DMC	X5076		
	For 400V: FSP-50DMC	X5077		

* For an alternate solution, specify the individual resistor part number RH500N25_OHMK in necessary series or parallel connection. Refer to the FSP servo amplifier section of this catalog for additional specifications, and the *FSP Series Servo System User's Manual* (YEA-SIA-FSP-3) for proper resistor sizing guidelines.

CE Pre-wired Cable Selection

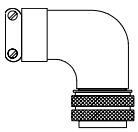
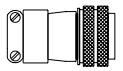
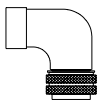
Use the table below to select shielded pre-wired power cables for your SGMGH Sigma II servomotor.

Cable Description **(C)**		Motor Size (kW)	Part Number*	Comments	Item Class
Power Cable with Connectors (IP67)		0.5, 0.9, 1.3	BACE-□□(A)	Use the following key to specify needed cable length (last two digits of the part number): 03: 3m 05: 5m 10: 10m (standard) 15: 15m 20: 20m	Limited Stock
		2.0, 3.0, 4.4	BBCE-□□(A)		
Power Cable for Holding Brake (IP67)		All	B7BCE-□□(A)		Limited Stock

* The "(A)" at the end of the cable number indicates the revision level. The revision level may be subject to change prior to this catalog's reprinting.

CE Connector Selection

Use the table below to select mating connectors for your SGMGH Sigma II servomotor.

Connector Description **(D)**		Motor Size (kW)	Part Number	Comments**	Item Class
Connector for Motor Power Cable*	 	0.5, 0.9, 1.3	CE05-8A18-10SD-B-BAS CE3057-10A-1(D265)	L-type connector Cable clamp (for diameters 0.413 to 0.555in)	Limited Stock
		2.0, 3.0, 4.4	CE05-8A22-22SD-B-BAS CE3057-12A-1(D265)	L-type connector Cable clamp (for diameters 0.492 to 0.630in)	
Connector for Holding Brake		All	CE05-8A10SL-3SC-B-BAS and CE3057-4A-1 (D265)	L-type connector for holding brake and Cable clamp (for diameters 0.142 to 0.220in)	
Connector for Encoder Cable (incremental or absolute encoder)			CE02-6A20-29NSW and CE20BA-S or CE3057-12A-3(D265)	L-type connector (plug and back shell) or Cable clamp (for diameters 0.265 to 0.394in)	

* Choose the connector and the associated cable clamp for a complete assembly. The connectors listed in the table are suitable for IP67 environments.

** Connectors are manufactured by DDK and listed here with the largest standard cable clamp available.

Higher rpm Power Rate Series

SGMSH/UH Servomotors - With Incremental / Absolute Encoder

Rated Output: 1.0kW, 1.5kW, 2.0kW, 3.0kW, 4.0kW, 5.0kW

For Additional Information	Page(s)
SGMSH/UH Ratings & Specifications	128
SGMSH/UH Speed/Torque Curves	129
SGMSH Dimensions	130–131
SGMUH Dimensions	132–133
SGMSH/UH Selection/Ordering Information	134–139
SGMSH/UH Optional CE Selection	140
FSP Ratings & Specifications	142
FSP Dimensions	144–148

Design Features

1. **Compact**
   - Small sized motor
   - Eight frame sizes: up to 422in • lb peak torque
2. **Higher Speed**
   - Rated Speed: 3000rpm
   - Maximum Speed: Up to 6000rpm (SGMUH only)
3. **Encoders**
   - 17-bit (32,768 ppr x 4) incremental encoder (standard)
   - 17-bit absolute encoder (option)
4. **Enclosure**
   - Totally enclosed, self-cooled IP67 (excluding shaft)
   - IP67 with shaft seal (option)
5. **Application Emphasis**
   - High torque to inertia ratio
   - Chip mounters
   - PCB drilling machines
   - Robots
   - Conveyors
   - Packaging
6. **Certified International Standards**
   - UL, cUL recognized (File #: E165827), CE compliance

Servomotor Ratings and Specifications

Time Rating: Continuous
Insulation: Class F
Vibration: 15μm or less
Withstand Voltage: $1500V_{ac}$, $1800V_{ac}$*
Insulation Resistance: 10MΩ minimum at $500V_{DC}$

Enclosure: Totally-enclosed, self-cooled IP67 (except for shaft opening)
Ambient Temperature: 0 to 40ºC
Ambient Humidity: 20 to 80% (non-condensing)
Rated Speed: 3000rpm, 6000rpm*

Maximum Rotational Speed: 5000, 6000rpm*
Excitation: Permanent magnet
Drive Method: Direct drive
Mounting: Flange-mounted
Painting Color: Muncell notation N1.5

* SGMUH models only.

Amplifier Systems Voltage	MOTORS:		Rated Output*	Rated Torque***		Instantaneous Peak Torque***		Rated Current*	Instantaneous Maximum Current*
	Type	Number	kW (hp)	N • m	lb • in (KG • cm)	N • m	lb • in (KG • cm)	A (rms)	A (rms)
$400V_{ac}$	SGMSH-	10D□A	1.0 (1.3)	3.18	28.2 (32.4)	9.54	84.4 (97.2)	2.8	8.5
		15D□A	1.5 (2.0)	4.9	43.4 (50)	14.7	130 (150)	4.7	14
		20D□A	2.0 (2.7)	6.36	56.4 (65)	19.1	169 (195)	6.2	19.5
		30D□A	3.0 (4.0)	9.8	87 (100)	29.4	260 (300)	8.9	28
		40D□A	4.0 (5.4)	12.6	112 (129)	37.8	336 (387)	12.5	38
		50D□A	5.0 (6.7)	15.8	140 (161)	47.6	422 (486)	13.8	42
	SGMUH-**	10D□A	1.0 (1.3)	1.59	14.1 (16.2)	6.5	57.6 (66.18)	2.7	8.5
		15D□A	1.5 (1.95)	2.45	21.7 (25)	11	97.5 (112)	4.1	14
		30D□A	3.0 (4.0)	4.9	43.5 (50)	21.5	190 (218.3)	8.1	28

** Only the Sigma II SGMUH models are available with a maximum speed of 6000rpm.

MOTORS:		Torque Constant	Moment of Inertia		Holding Brake (at 20°C)					Allowable Load Inertia	Rated Power Rate*	Rated Angular Acceleration*	Inertia Time Constant	Inductive Time Constant
					Capacity	Torque	Coil Resistance	Rated Current	Additional Inertia					
Type	Number	$\frac{lb_f \cdot in}{A_{rms}}$	$lb_f \cdot in \cdot s^2 \times 10^{-3}$	$KG \cdot m^2 \times 10^{-4}$	W	N • m	W	A	$lb_f \cdot in \cdot s^2 \times 10^{-3}$	$KG \cdot m^2 \times 10^{-4}$	kW/s	rad/s^2	ms	ms
SGMSH-	10D□A	11.2	1.54	1.74	7.0	7.84	82.3	0.29	0.219	8.7	57.9	18250	0.97	6.3
	15D□A	10.2	2.19	2.47						12.4	97.2	19840	0.80	6.8
	20D□A	9.9	2.82	3.19						16.0	127	19970	0.66	7.3
	30D□A	10.5	6.20	7.00	9.85	20.0	58.7	0.41	1.89	35.0	137	14000	0.76	16.3
	40D□A	9.38	8.50	9.60						48.0	166	13160	—	—
	50C□A	10.62	10.9	12.3						61.5	202	12780	—	—
SGMUH-	10D□A	7.2	1.54	1.74	—	—	—	—	—	8.7	14.5	9130	0.87	7.1
	15D□A	7.4	2.19	2.47	—	—	—	—	—	12.4	24.3	9910	0.70	7.7
	30D□A	7.2	6.2	7.0	—	—	—	—	—	35	34.3	7000	0.72	17.3

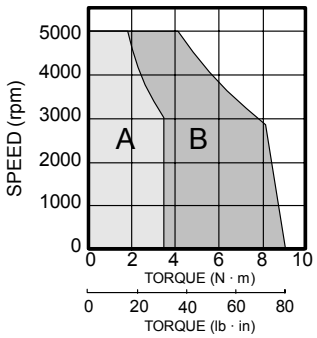
*** These items and torque-speed characteristics quoted in combination with an FSP servo amplifier at an armature winding temperature of 20°C.

Note: These characteristics can be obtained when the following heat sinks (steel plates) are used for cooling purposes:
Type 10D□A to 20D□A: (11.81 × 11.81 × 0.47 (in)) (300 × 300 × 12 (mm))
Type 30D□A to 50D□A: (15.75 × 15.75 × 0.79 (in)) (400 × 400 × 20 (mm))

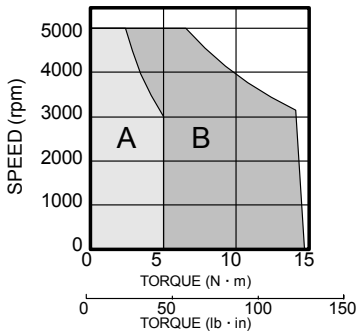
Speed / Torque Curves

400V

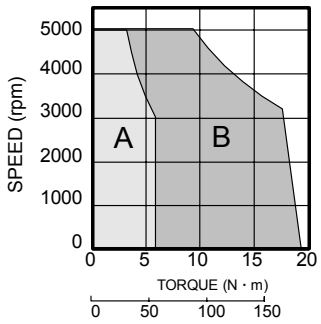
SGMSH-10D□A



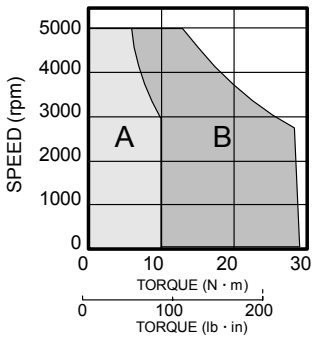
SGMSH-15D□A



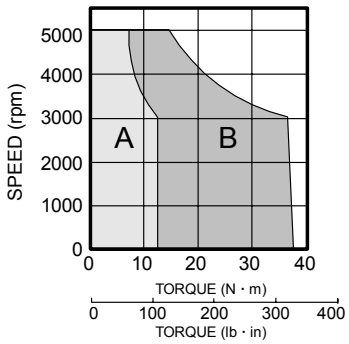
SGMSH-20D□A



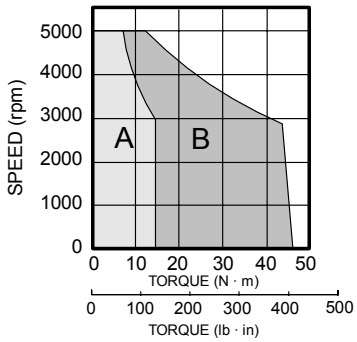
SGMSH-30D□A



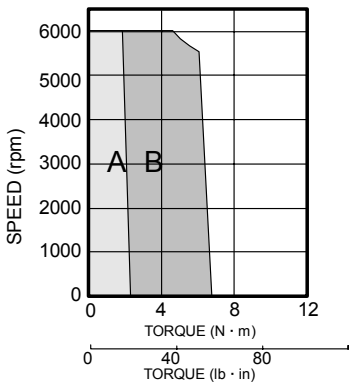
SGMSH-40D□A



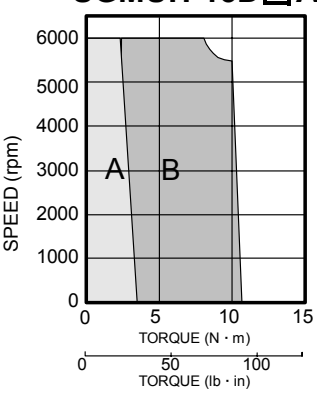
SGMSH-50D□A



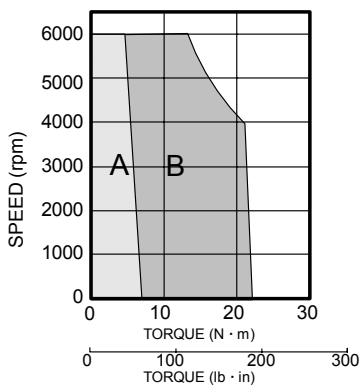
SGMUH-10D□A



SGMUH-15D□A



SGMUH-30D□A

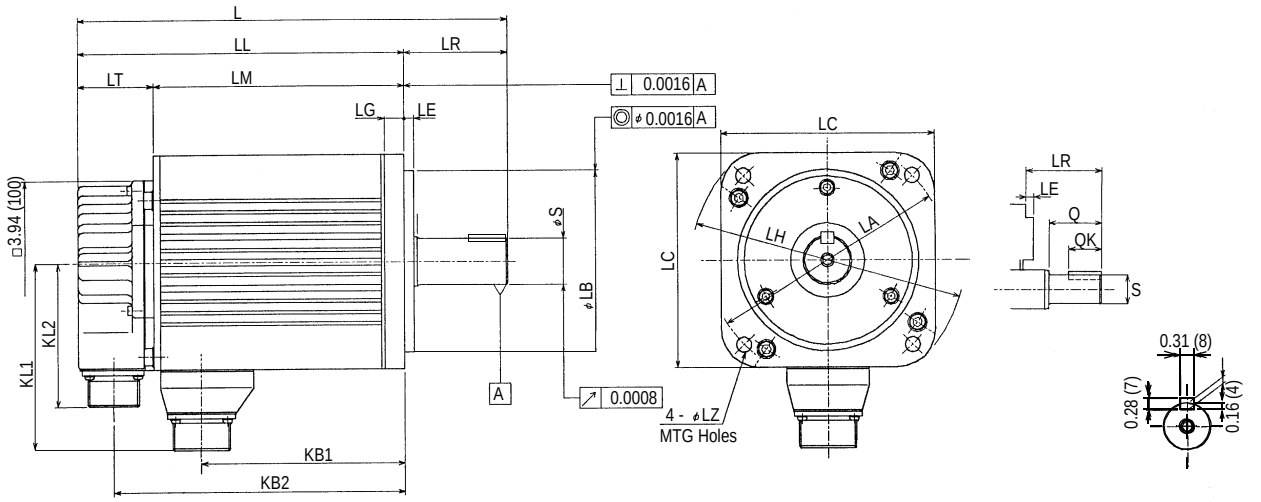


A : CONTINUOUS DUTY ZONE

B : INTERMITTENT DUTY ZONE

SGMSH Dimensions in inches (mm)

(1) 17-bit Incremental or Absolute Encoder

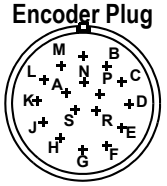


Type SGMSH-	L	LL	LM	LR	LT	KB1	KB2	KL1	KL2	Flange Dimensions							Shaft End Dimension			Approximate Mass lb_f (kg)	Allowable Radial Load lb_f (N)	Allowable Thrust Load lb_f (N)
										ΦLA	ΦLB**	LC	LE	LG	ΦLH	ΦLZ	ΦS*	Q	QK			
10D□A61	7.64 (194)	5.87 (149)	4.06 (103)	1.77 (45)	1.81 (46)	2.99 (76)	5.04 (128)	3.78 (96)	3.43 (87)	4.53 (115)	3.74 (95)	3.94 (100)	0.12 (3)	0.39 (10)	5.12 (130)	0.28 (7)	0.94 (24)	1.57 (40)	1.26 (32)	10.1 (4.6)	154 (686)	44 (196)
15D□A61	8.66 (220)	6.89 (175)	5.08 (129)			4.02 (102)	6.06 (154)													12.8 (5.8)		
20D□A61	9.57 (243)	7.8 (198)	5.98 (152)			4.92 (125)	6.97 (177)													15.4 (7.0)		
30D□A61	10.31 (262)	7.83 (199)	6.02 (153)	2.48 (63)		4.8 (122)	7.01 (178)	4.49 (114)	3.43 (87)	5.71 (145)	4.33 (110)	5.12 (130)	0.24 (6)	0.47 (12)	6.5 (165)	0.35 (9)	1.1 (28)	2.17 (55)	1.96 (50)	24.3 (11)	220 (980)	88 (392)
40D□A61	11.77 (299)	9.29 (236)	7.48 (190)			6.26 (159)	8.46 (215)													30.9 (14)	265 (1176)	
50D□A61	13.35 (339)	10.87 (276)	9.06 (230)			7.83 (199)	10.04 (255)													37.5 (17)		

Note: 1. Dimensions are the same when using either incremental or absolute encoders (with or without optional shaft seal).
2. Tolerances on the dimensions of flange type LB and shaft extensions S are based on JIS (Japanese Industrial Standard) B0401 "Limits and Fits for Engineering."

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.9449, 1.1024	+0.0000-0.0005	3.7402, 4.3307	+0.0000 -0.0014
mm	24.000, 28.000	+0.000 -0.013	95.000, 110.000	+0.000 -0.035

Encoder Plug



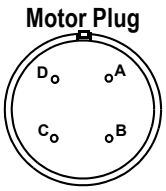
MS3102A20-29P

Connector Wiring on the Incremental Encoders			
A	—	K	—
B	—	L	—
C	Data +	M	—
D	Data –	N	—
E	—	P	—
F	—	R	—
G	0V	S	Battery – (Note*)
H	+5V_{dc}	T	Battery + (Note*)
J	FG (Frame Ground)		

*Note: Used with an absolute encoder only.

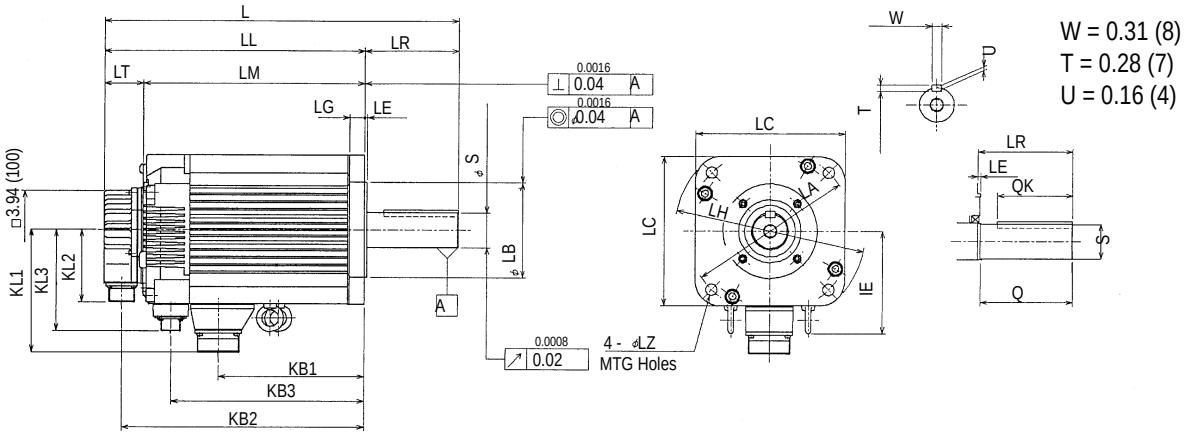
Non-Environmental Mating Connector:
MS3108B20-29S (L Type)
MS3106B20-29S (Straight Type)
Cable Clamp: MS3057-12A

Motor Plug



Connector Wiring on the Motor Side	
A	U Phase
B	V Phase
C	W Phase
D	Ground Terminal

(2) 17-bit Incremental or Absolute Encoder, with Brake



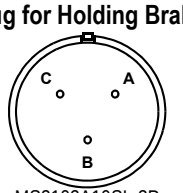
SGMSH Servomotors

Type SGMSH-	L	LL	LM	LR	LT	KB1	KB2	KB3	KL1	KL2	KL3	Flange Dimensions							Shaft End Dimension			Approximate Mass lb_f (kg)	Allowable Radial Load lb_f (N)	Allowable Thrust Load lb_f (N)
												ΦLA	ΦLB**	LC	LE	LG	ΦLH	ΦLZ	ΦS*	Q	QK			
10D□A6C	9.37 (238)	7.6 (193)	5.79 (147)	1.77 (45)	1.81 (46)	2.99 (76)	6.77 (172)	4.72 (120)	378 (96)	3.46 (88)	3.35 (85)	4.53 (115)	3.74 (95)	3.94 (100)	0.12 (3)	0.39 (10)	5.12 (130)	0.28 (7)	0.94 (24)	1.57 (40)	1.26 (32)	13.2 (6.0)	154 (686)	44 (196)
15D□A6C	10.39 (264)	8.62 (219)	6.81 (173)	1.77 (45)		4.02 (102)	7.80 (198)	5.75 (146)														16.5 (7.5)		
20D□A6C	11.3 (287)	9.53 (242)	7.72 (196)	1.77 (45)		4.92 (125)	8.7 (221)	6.65 (169)														18.7 (8.5)		
30D□A6C	11.81 (300)	9.33 (237)	7.52 (191)	2.48 (63)		4.80 (122)	8.50 (216)	6.69 (170)	4.49 (114)		3.86 (98)	5.71 (145)	4.33 (110)	5.12 (130)	0.24 (6)	0.47 (12)	6.5 (165)	0.35 (9)	1.1 (28)	2.17 (55)	1.96 (50)	30.9 (14)	220 (980)	88 (392)
40D□A6C	13.27 (337)	10.79 (274)	8.98 (228)			—	—	—	—		—											37.5 (17)	265 (1176)	
50D□A6C		12.36 (314)	10.55 (268)			—	—	—	—		—											44.1 (20)		

Note: 1. Dimensions are the same when using either incremental or absolute encoders (with or without optional shaft seal).
2. Tolerances on the dimensions of flange type LB and of shaft extensions S are based on JIS (Japanese Industrial Standard) B0401 "Limits and Fits for Engineering."

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.9449, 1.1024	+0.0000-0.0005	3.7402, 4.3307	+0.0000 -0.0014
mm	24.000, 28.000	+0.000 -0.013	95.000, 110.000	+0.000 -0.035

Plug for Holding Brake

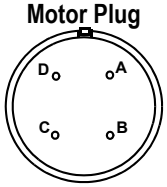


MS3102A10SL-3P

Connector Wiring on the Brake, Motor Side	
A	Brake Terminal
B	Brake Terminal
C	—

Non-Environmental Mating Connector:
MS3108A10SL-3S (L Type)
MS3106A10SL-3S (Straight Type)
Cable Clamp: MS3057-4A

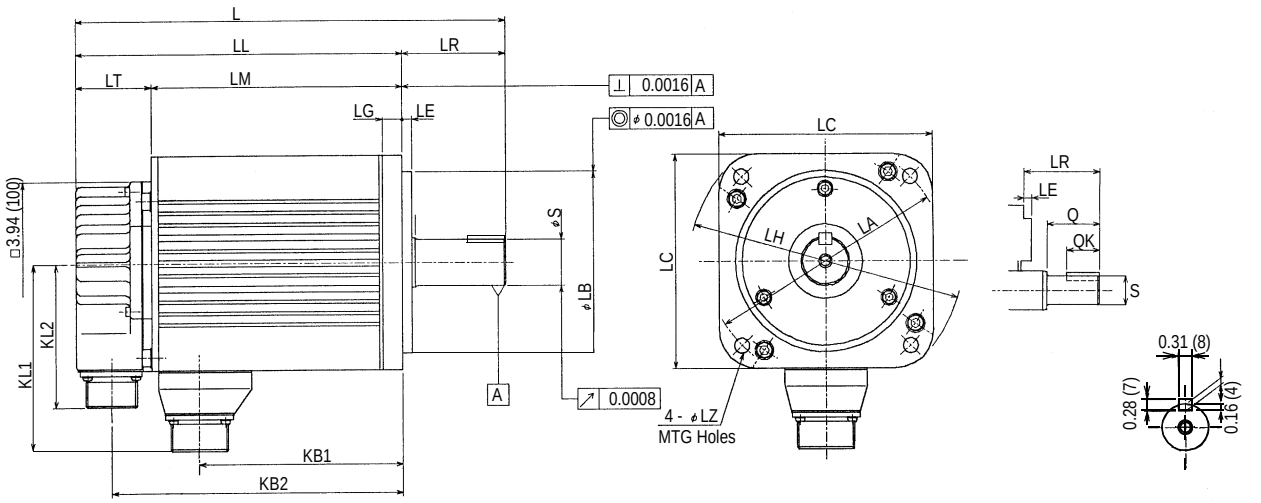
Motor Plug



Connector Wiring on the Motor Side	
A	U Phase
B	V Phase
C	W Phase
D	Ground Terminal

SGMUH Dimensions in inches (mm)

(1) 17-bit Incremental or Absolute Encoder

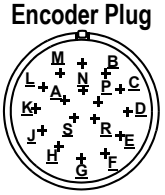


Type SGMUH-	L	LL	LM	LR	LT	KB1	KB2	KL1	KL2	Flange Dimensions							Shaft End Dimension			Approximate Mass lb_f (kg)	Allowable Radial Load lb_f (N)	Allowable Thrust Load lb_f (N)
										ΦLA	ΦLB**	LC	LE	LG	ΦLH	ΦLZ	ΦS*	Q	QK			
10D□A61	7.64 (194)	5.87 (149)	4.06 (103)	1.77 (45)	1.81 (46)	2.99 (76)	5.04 (128)	3.78 (96)	3.46 (88)	5.12 (130)	4.33 (110)	4.57 (116)	0.14 (3.5)	0.39 (10)	5.91 (150)	0.35 (9)	0.94 (24)	1.57 (40)	1.26 (32)	10.1 (4.6)	110 (490)	22 (98)
15D□A61	8.66 (220)	6.89 (175)	5.08 (129)			4.02 (102)	6.06 (154)													12.8 (5.8)		
30D□A61	10.31 (262)	7.95 (202)	6.14 (156)	2.36 (60)		5.00 (127)	7.13 (181)	4.49 (114)		6.50 (165)	5.12 (130)	6.10 (155)		0.47 (12)	7.48 (190)	0.43 (11)	1.1 (28)	2.17 (55)	1.96 (50)	24.3 (11)	154 (686)	44.1 (196)

Note: 1. Dimensions are the same when using either incremental or absolute encoders (with or without optional shaft seal).
2. Tolerances on the dimensions of flange type LB and shaft extensions S are based on JIS (Japanese Industrial Standard) B0401 "Limits and Fits for Engineering."

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.9449, 1.1024	+0.0000-0.0005	4.3307	+0.0005 -0.00035
			5.12	+0.00055 -0.00043
mm	24.000, 28.000	+0.000 -0.013	110.000	+0.013 -0.009
			130	+0.014 -0.011

Encoder Plug

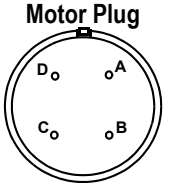


MS3102A20-29P

Connector Wiring on the Incremental Encoders			
A	—	K	—
B	—	L	—
C	Data +	M	—
D	Data –	N	—
E	—	P	—
F	—	R	—
G	0V	S	Battery – (Note*)
H	$+5V_{dc}$	T	Battery + (Note*)
J	FG (Frame Ground)	*Note: Used with an absolute encoder only.	

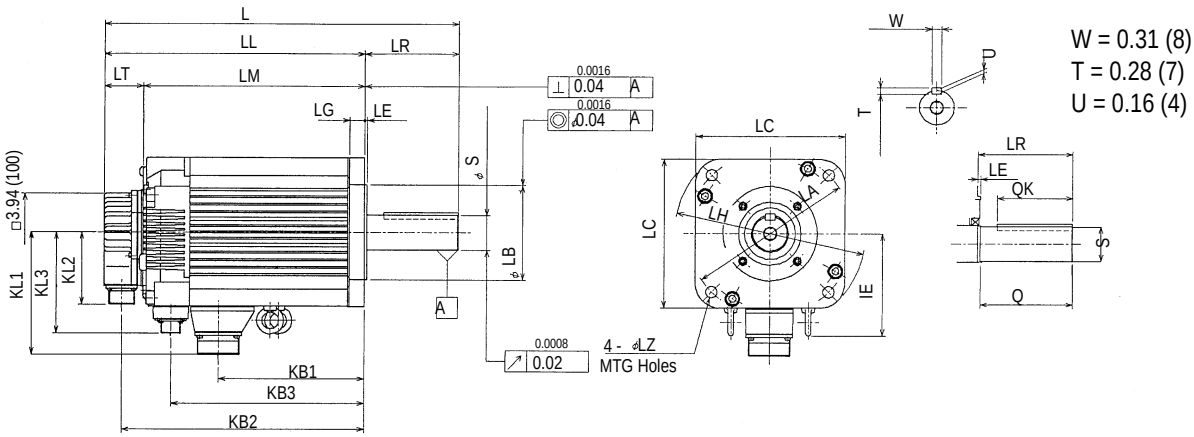
Non-Environmental Mating Connector:
MS3108B20-29S (L Type)
MS3106B20-29S (Straight Type)
Cable Clamp: MS3057-12A

Motor Plug



Connector Wiring on the Motor Side	
A	U Phase
B	V Phase
C	W Phase
D	Ground Terminal

(2) 17-bit Incremental or Absolute Encoder, with Brake

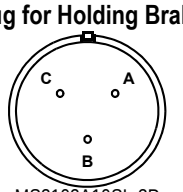


Type SGMUH-	L	LL	LM	LR	LT	KB1	KB2	KB3	KL1	KL2	KL3	Flange Dimensions							Shaft End Dimension			Approximate Mass lb$_f$ (kg)	Allowable Radial Load lb$_f$ (N)	Allowable Thrust Load lb$_f$ (N)
												ΦLA	ΦLB**	LC	LE	LG	ΦLH	ΦLZ	ΦS*	Q	QK			
10D□A6C	9.37 (238)	7.6 (193)	5.79 (147)	1.77 (45).	1.81 (46)	2.99 (76)	6.77 (172)	4.72 (120)	3.78 (96)	3.46 (88)	3.35 (85)	5.12 (130)	4.33 (110)	4.57 (116)	0.14 (3.5)	0.39 (10)	5.91 (150)	0.35 (9)	0.94 (24)	1.57 (40)	1.26 (32)	13.2 (6.0)	110 (490)	22 (98)
15D□A6C	10.39 (264)	8.62 (219)	6.81 (173)			4.02 (102)	7.80 (198)	5.75 (146)														16.5 (7.5)		
30D□A6C	11.81 (300)	9.33 (237)	7.52 (191)	2.36 (60)		4.80 (122)	8.50 (216)	6.69 (170)	4.49 (114)		3.86 (98)	6.50 (165)	5.12 (130)	6.10 (155)	0.24 (6)	0.47 (12)	7.48 (190)	0.43 (11)	1.1 (28)	2.17 (55)	1.96 (50)	30.9 (14)	154 (686)	44 (196)

Note: 1. Dimensions are the same when using either incremental or absolute encoders (with or without optional shaft seal).
2. Tolerances on the dimensions of flange type LB and of shaft extensions S are based on JIS (Japanese Industrial Standard) B0401 "Limits and Fits for Engineering."

Specified Tolerances				
Dimension	*ΦS		**ΦLB	
Unit	Diameter	Tolerance	Diameter	Tolerance
in	0.9449, 1.1024	+0.0000-0.0005	4.3307	+0.0005 -0.00035
			5.12	+0.00055 -0.00043
mm	24.000, 28.000	+0.000 -0.013	110.000	+0.013 -0.009
			130	+0.014 -0.011

Plug for Holding Brake

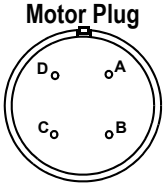


MS3102A10SL-3P

Connector Wiring on the Brake, Motor Side	
A	Brake Terminal
B	Brake Terminal
C	—

Non-Environmental Mating Connector:
MS3108A10SL-3S (L Type)
MS3106A10SL-3S (Straight Type)
Cable Clamp: MS3057-4A

Motor Plug

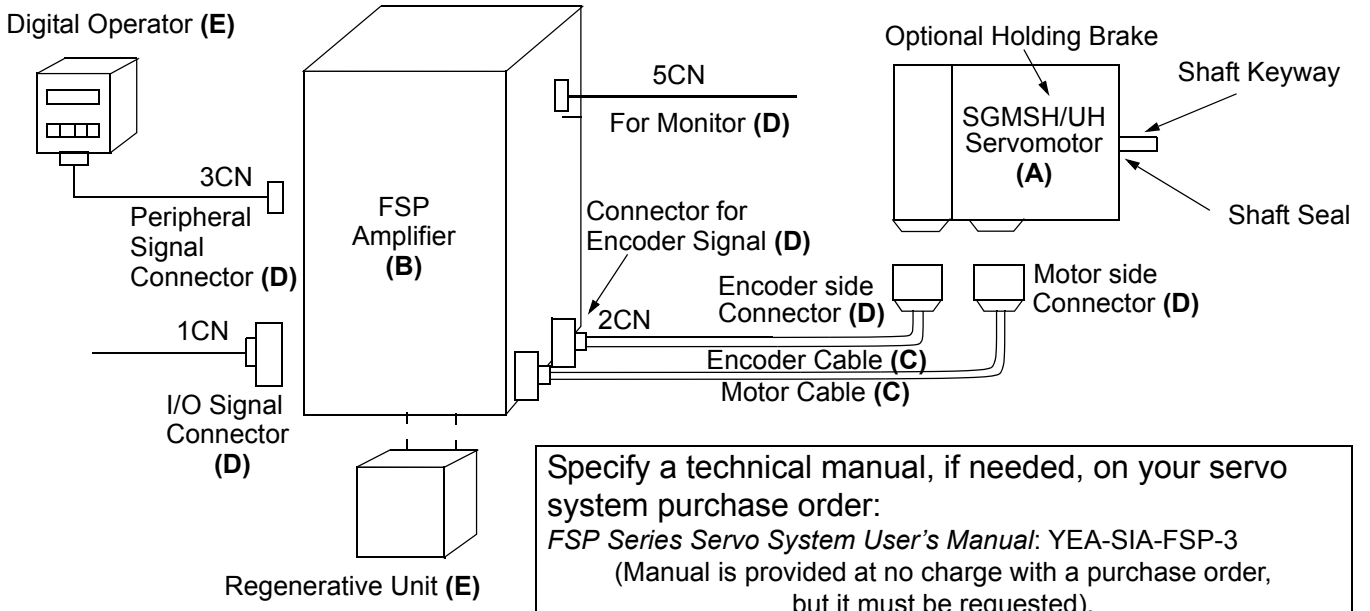


Connector Wiring on the Motor Side	
A	U Phase
B	V Phase
C	W Phase
D	Ground Terminal

Selecting : SGMSH/UH Sigma II Servo System

First, select the Sigma series servomotor suited for your application using SigmaSize: the Yaskawa servomotor sizing software, available at www.yaskawa.com. (You may also request SigmaSize software via e-mail, at: literature@yaskawa.com).
Use the diagram below to locate and identify the components of your system. Each item is letter-coded and cross-referenced in the option tables on the following pages.

System Configuration



Specify a technical manual, if needed, on your servo system purchase order:
FSP Series Servo System User's Manual: YEA-SIA-FSP-3
(Manual is provided at no charge with a purchase order, but it must be requested).

Model Number Designation

SGMSH - 10 D C A 6 1

Sigma Servomotor Type
- SGMSH: 5000rpm
- SGMUH: 6000rpm

Rated Output
- 10: 1.0kW (1.3hp)
- 15: 1.5kW (2.0hp)
- 20: 2.0kW (2.7hp)
- 30: 3.0kW (4.0hp)
- 40: 4.0kW (5.4hp)
- 50: 5.0kW (6.7hp)

Power Supply
- D: 400V

Encoder Specifications
- C: 17-bit Incremental Encoder
- 2: 17-bit Absolute Encoder*

Rated Speed
- A: Revision Level

Shaft Specifications
- 6: Straight Shaft with Keyway

Accessories
- 1: Standard
- C: $24V_{DC}$ Brake
- S: Shaft Seal
- E: Shaft Seal and Brake

*SGMUH is not available with absolute encoder

Servomotor and Amplifier Selection

Use the table below to select the appropriate SGMSH or SGMUH Sigma series servomotor and amplifier.

(Refer to the motor model # designation on the previous page specifying the available modification to motor construction/features.)

Description	Peak Torque (in • lb)	Rated Torque (in • lb)	Motor Inertia (in • lb • s^2 X 10^{-3})	Motor MODEL # **(A)**	Amplifier MODEL # **(B)*** Analog/Digital Input FSP-	Motor and Amplifier Item Class
400V, Three-Phase 17-bit Incremental Encoder Straight Shaft with Keyway **5000rpm** maximum MS Connectors	84.4	28.2	1.54	SGMSH-10DCA61	10DMC	Stock
			1.76	SGMSH-10DCA6C		
	130	43	2.19	SGMSH-15DCA61	15DMC	
			2.41	SGMSH-15DCA6C		
	169	56.4	2.82	SGMSH-20DCA61	20DMC	
			3.04	SGMSH-20DCA6C		
	260	87	6.2	SGMSH-30DCA61	30DMC	
			8.1	SGMSH-30DCA6C		
	336	112	8.5	SGMSH-40DCA61	50DMC	
			10.4	SGMSH-40DCA6C		
	422	140	10.9	SGMSH-50DCA61		
			12.8	SGMSH-50DCA6C		
400V, Three-Phase 17-bit Incremental Encoder Straight Shaft with Keyway **6000rpm** maximum MS Connectors	57.6	14.1	1.54	SGMUH-10DCA61	10DMC	
	97.5	21.7	2.48	SGMUH-15DCA61	15DMC	
	190	43.4	6.2	SGMUH-30DCA61	30DMC	

Note: $24V_{DC}$ brakes for SGMUH and SGMSH Sigma series servomotors are standard. Contact a local source for $24V_{DC}$ power supplies.

For technical information, request Yaskawa manual number YEA–SIA–FSP-3.

* For more detailed FSP amplifier specifications and dimensions, refer to pages 143 to 148.

Pre-wired Cable Selection

Use the table below to select pre-wired cables for your SGMSH/UH Series Sigma series servomotor.

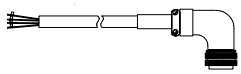
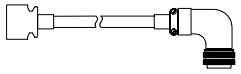
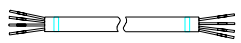
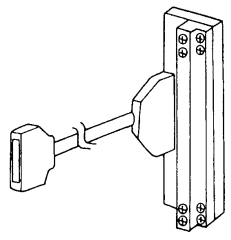
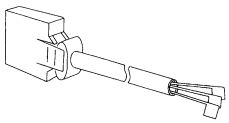
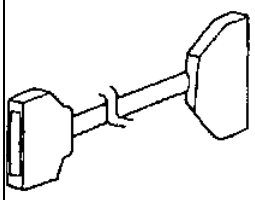
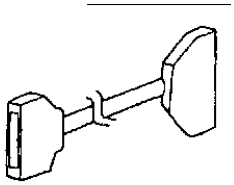
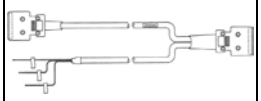
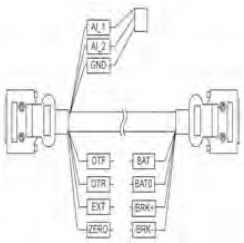
Cable Description **(C)**		Motor Size (kW)	Part Number*	Comments	Item Class
Power Cable with L-type Connectors (IP67)		1.0, 1.5, 2.0	BAE-□□(A)	Use the following key to specify needed cable length (last two digits of the part number): 03: 3m 05: 5m 10: 10m (standard) 15: 15m 20: 20m	Stock**
		3.0 4.0, 5.0	BBE-□□(A)		
Cable with Holding Brake (IP67)		All	B7BCE-□□(A)		
Encoder Cable (incremental or absolute) (IP67)			AFGHCE-□□(A)	These cables are available in five lengths. (last two digits of the part number): 03: 3m 05: 5m 10: 10m (standard) 15: 15m 20: 20m	
Encoder feedback adapter cable for incremental and absolute****	–		AFAD-P2(A)	Connects these full length encoder feedback cables to the FSP amplifier (Encoder feedback cables for SGDH amp) JZSP-CMP00-XX(A) A1ICE-XX(A) JZSP-CMP02-XX(B) 0.2 meter length	
Encoder feedback adapter cable for absolute encoders. Cable has built in absolute encoder battery and case.	–		AFADABS-P2(A)	Connects these full length encoder feedback cables to the FSP amplifier (Encoder feedback cables for SGDH amp) JZSP-CMP00-XX(A) A1ICE-XX(A) JZSP-CMP02-XX(B) Built-in battery is: JZSP-BA01 0.2 meter length	
Encoder Cable (for applications up to 20m) Only for Solder Connections			FR-RMCT-SB	These cables are available in any length.	
Encoder Cable (for applications from >20 to <50m) Only for Solder Connections			UL20276-SB	For example, to order one FR-RMCT-SB cable, 16m long, specify: quantity: 16 part no.: FR-RMCT-SB	
Input/Output 1CN Cable & Transition Terminal Block			JUSP-TA50P	35mm DIN rail mountable; the cable length is 0.5 meters.	
			JUSP–WA50P–□□	35mm DIN Rail mountable D50: 0.5 meters (standard) 01: 1 meter (standard) 02: 2 meters 03: 3 meters	

Table continued on next page.

Cable Description **(C)**		Motor Size (kW)	Part Number*	Comments	Item Class
Input/Output 1CN Cable with Pigtail Leads			JZSP-CKI01-☐(A)	Use the following key to specify required cable length (last digit of part number): 1: 1m (standard) 2: 2m 3: 3m	Stock**
Input/Output 1CN Cable with Female D-Sub output Connector***			JZSP-CKI0D-☐☐	Use the following key to specify required cable length (last two digits of the part number): D50: 0.5m 01: 1m (standard) 02: 2m 03: 3m Not all terminals used. YEA recommends 1CN with pigtail JZSP–CKF01–☐(A). See page 89 for wiring details.	
Input/Output 1CN SMC4000 to FSP Interface Cable		All	SMCCBL2☐☐	Use the following key to determine the desired length specification. ☐☐= 02: 2 Feet 05: 5 Feet 10: 10 Feet 15: 15 Feet	
Input/Output 1CN SMC4000 to FSP Interface Cable with prepared alarm and reset inputs. requires jumper in SMC4000			SMCCBLH☐☐		
Input/Output 1CN SMC4000 to FSP Interface Cable with flying leads for additional amplifier I/O			SMCCBLB☐☐		Limited Stock
Input/Output 1CN MP2000 series controller to FSP Interface Cable			JEPMC–W2040–☐☐	Use the following key to determine the desired length specification. ☐☐= A5: 0.5 meters 01: 1 meter 03: 3 meters	

* (A) at the end of the cable number is the revision level. The revision level may be changed prior to this catalog's reprinting.

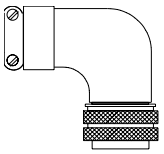
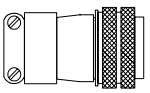
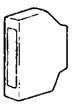
** Standard cable lengths are Stock items; non-standard cable lengths are Limited Stock items.

*** 50-pin Female D-Sub output connector mates to customer supplied third party terminal block. (e.g., Wago #289-449, Weidmuller #919658, Phoenix #2283647, Amphenol/Sine #20-51039, and many others).

**** For systems using the absolute encoder and this part number, the absolute encoder battery must be connected at the amplifier 1CN connector.

Connector Selection

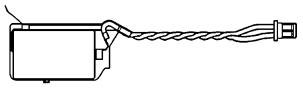
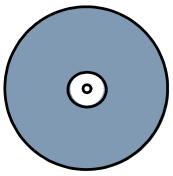
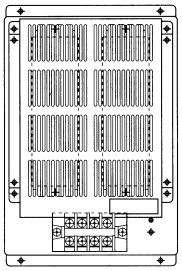
Use the table below to select mating connectors for your SGMSH/UH Sigma series servomotor.

Connector Description **(D)**		Motor Size (kW)	Part Number	Comments	Item Class
MS Connector for Motor Power Cable*		1.0, 1.5, 2.0	MS3106B18-10S	Straight-type connector	Stock
			MS3108B18-10S	L-type connector	
			MS3057-10A	Cable clamp	
		3.0, 4.0, 5.0	MS3106B22-22S	Straight-type connector	
			MS3108B22-22S	L-type connector	
			MS3057-12A	Cable clamp	
MS Connector for Brake Power Cable		All	MS3108A-10SL-3S	L-type connector	
			MS3057-4A	Cable clamp	
MS Connector for Encoder Cable (incremental or absolute encoder)		All	MS3106B20-29S	Straight-type connector	
			MS3108B20-29S	L-type connector	
			MS3057-12A	Cable clamp	
1CN Mating Connector			JZSP-CKI9	—	
2CN Amplifier Mating Connector			DE9406973*	—	
3CN Peripheral Mating Connector	—		YSC-1	—	
5CN Connector and 1m Cable with Pigtails	—		JZSP-CA01	—	

* Alternative Part Number: DTCR6973

Peripheral Device Selection

Use the table below to select peripheral devices for your SGMSH/UH Sigma series servomotor.

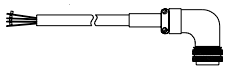
Component (E)		Part Number	Description	Item Class
Absolute Encoder Battery		JZSP-BA01	3.6V, 1000mAh (Lithium Battery) with 5cm leads for wiring to 1CN	Stock
		JZSP-BA01	3.6V, 1000mAh (Lithium Battery) replacement battery for use in absolute adapter cable AFAD-ABS-P2(A)	
Flexworks		FSPGUI1 or download at www.yaskawa.com	–	
Software Interface Cable	—	YS-12	Pre-wired 2.0m cable with 9-pin connector	
External Regenerative Unit (Optional)		JUSP-RA04	These are general purpose regenerative units.* Order the Motion document: PI#99004 for setup instructions for this unit. **Caution:** Proper setup is necessary to avoid equipment damage.	
DC Reactor (for suppressing harmonics in the power supply)	FSP-10DMC FSP-15DMC	X5075	—	Limited Stock
	FSP-20DMC FSP-30DMC	X5076		
	Large Capacity Amplifiers	Check factory for availability		

* For an alternate solution, specify the individual resistor part number RH500N25_OHMK in necessary series or parallel connection. Refer to the FSP servo amplifier section of this catalog for additional specifications, and the *FSP Series Servo System User's Manual* (YEA-SIA-FSP-3) for proper resistor sizing guidelines.

CE Pre-wired Cable Selection

Use the table below to select shielded pre-wired cables for your SGMSH/UH Sigma II servomotor. These are suitable for IP67 environments.

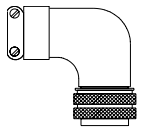
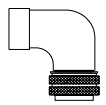
Use the standard encoder cable listed on page 148.

Cable Description **(C)**		Motor Size (kW)	Part Number*	Comments	Item Class
Power Cable with Connectors (IP67)		1.0, 1.5, 2.0	BACE-□□(A)	Use the following key to specify needed cable length (last two digits of the part number): 03: 3m 05: 5m 10: 10m (standard) 15: 15m 20: 20m	Limited Stock
		3.0,4.0, 5.0	BBCE-□□(A)		
Power Cable for Holding Brake (IP67)		All	B7BCE-□□(A)		

* The "(A)" at the end of the cable number indicates the revision level. The revision level may be subject to change prior to this catalog's reprinting.

CE/IP67 Connector Selection

Use the table below to select mating connectors for your SGMSH/UH Sigma series servomotor.

Connector Description **(D)**		Motor Size (kW)	Part Number	Comments**	Item Class
Connector for Motor Power Cable*		1.0, 1.5, 2.0	CE05-8A18-10SD-B-BAS CE3057-10A-1(D265)	L-type connector Cable clamp (for diameters 0.413 to 0.555in)	Limited Stock
		3.0, 4.0, 5.0	CE05-8A22-22SD-B-BAS CE3057-12A-1(D265)	L-type connector Cable clamp (for diameters 0.492 to 0.630in)	
Connector for Holding Brake		All	CE05-8A10SL-3SC-B-BAS and CE3057-4A-1 (D265)	L-type connector for holding brake Cable clamp (for diameters 0.142 to 0.220in)	
Connector for Encoder Cable (incremental or absolute encoder)			CE02-6A20-29NSW and CE20BA-S CE3057-12A-3(D265)	L-type connector (plug and back shell) Cable clamp (for diameters 0.265 to 0.394in)	

* Choose the connector and the associated cable clamp for a complete assembly. The connectors listed in the table are suitable for IP67 environments.

** Connectors are manufactured by DDK and listed here with the largest standard cable clamp available.

FSP Servo Amplifier-

For Speed, Torque, & Position Control
With Incremental or Absolute Encoder

Wide input voltage
Range 380-480 VAC

For Additional Information	Page(s)
FSP Ratings & Specifications	143 - 146
FSP Dimensions	149 - 153
Peripherals	156 - 158
SGMGH Sigma II Servo System	115 - 126

Design Features

1. Flexible Servo Architecture

- Traditional torque, speed, and pulse input modes (SGDH modes)
- Additional programmable position mode for simple indexing applications
- Electronic gearing, indexing superimposed on gear ratio
- Electronic Cam table with shift and offset while in motion
- Dynamic Positioning, change target speed or position while in motion

2. Improved Performance

- Patented Non-linear Control Technology reduces tracking error 90% in some applications
- Adaptive feed forward dramatically reduces settling time and overshoot
- High speed input and output for integrating motion (125 usec)
- Registration input (CN1-46) for latching position in hardware (62.5 usec)

3. Easy Operation

- FlexWorks set-up software provides a project setup Wizard
  - Choose amplifier mode
  - Define user units
  - Get default motion profile values
  - Define end of motion parameters
  - Define digital I/O
- In addition, Flexworks provides
  - Programming by pull down menu
  - Digital Oscilloscope tuning
  - Advanced FFT mechanical analysis
- Sigma FSP automatically recognizes Yaskawa Sigma II motors
- RMS torque monitor of front panel

4. CN10 side port for future* expanded capabilities (MECHATROLINK)

5. Certified International Standards

- UL, cUL listed, CE compliance

* Contact Yaskawa Rep.

Model Number Designation

FSP 1 5 D MC - ☐

FSP Servo Amplifier

Rated Output
- 05: 0.50kW
- 10: 1.00kW
- 15: 1.50kW
- 20: 2.00kW
- 30: 3.00kW
- 50: 5.00kW

Options:
- ☐: No options
- C: Electronic Cam (ECAM)

Control Type: See Table Below

Power Supply
- D: 400V

Control Type	Details
MC	• Flexible ServoPack with standard Yaskawa serial encoder feedback for use with Sigma II motors.
MH	• Flexible ServoPack with A-B quadrature encoder feedback with Hall effect commutation.* • No Yaskawa serial encoder feedback. • Servo Amplifier - Motor combinations supported by Yaskawa can be found at www.Yaskawa.com under the FSP product section: Special Purpose Motors.

IMPORTANT:
*Parameter settings for motor combinations that are not in this catalog can only be set at the factory. For further information, see the Special Purpose Motor Program at www.yaskawa.com under the FSP product section.

Sigma FSP Combinations **		
Sigma FSP	**FSP-xxxMC**	**FSP-xxxMH**
Servomotors (one size up or down by power)	Rotary SGMAH, SGMPH, SGMGH, SGMSH, SGMUH - **NO SGMCS** Linear SGLGW, SGLFW, SGLTW, Sigma Trac with Serial Converter	SPM - Special Purpose Motor Requires FSP-xxxMH model and Supported Motor Data File - **NO Yaskawa Serial Encoder**
Option Modules	NS115 Mechatrolink II Planned for Mid 2007** Expanded I/O (8in/8out) Planned for Mid 2007** - **No NS300, NS500, NS600, MP940**	NS115 Mechatrolink II Planned for Mid 2007** Expanded I/O (8in/8out) Planned for Mid 2007** - **No NS300, NS500, NS600, MP940**
Software	FlexWorks only	FlexWorks only

** Consult www.yaskawa.com for recent updates

FSP Amplifier Ratings and Specifications

FSP-			05	10	15	20	30	50
Applicable Servomotor	SGMGH-□D		05	09	13	20	30	44
	SGMSH-□D		–	10	15	20	30	40 50
	SGMUH-□D		–	10	15	–	30	–
Basic Specifications	Maximum Applicable Servomotor Capacity [kW]		0.45	1.00	1.50	2.00	3.00	5.00
	Continuous Output Current [A_{rms}]		1.9	3.5	5.4	8.4	11.9	16.5
	Maximum Output Current [A_{rms}]		5.5	8.5	14	20	28	40.5
	Input Power Supply	Main Circuit	Single-phase 380 to 480VAC +10 to -15%, 50/60Hz					
		Control Circuit	24VDC ±15%, 0.7A					
	Control Method		Single or three-phase full-wave rectification IGBT-PWM (sine wave driven)					
	Feedback		For Yaskawa servomotors: Serial encoder: 17-bit (incremental/absolute) For Special Purpose Motors: A-B quadrature, max frequency 800 kHz post quadrature					
	Conditions	Ambient/Storage Temperature *	0 to +55°C/-20 to +85°C (When enclosed, internal temperatures must not exceed this range.)					
		Ambient/Storage Humidity	90% relative humidity or less (with no condensation)					
		Vibration/Shock Resistance	4.9 m/s^2 /19.6 m/s^2					
	Configuration		Base mounted (Rack mounted optional)					
	FSP-		**05**	**10**	**15**	**20**	**30**	**50**
	Approx. Mass [kg (lb)]		1.7 (3.75)		2.8 (6.17)		3.8 (8.38)	5.5 (12.1)

Ratings and Specifications (cont'd)

FSP-05~50				
Speed and Torque Control Modes	Performance	Speed Control Range		1:5000 (The lowest speed of the speed control range is the point just before the motor stops under full-load condition)
		Speed Regulation **	Load Regulation	0 to 100% load: 0.01% maximum (at rated speed)
			Voltage Regulation	Rated Voltage ±10%: 0% (at rated speed)
			Temperature Regulation	25 ± 25°C: ±0.1% max. (at rated speed)
		Frequency Characteristics		400Hz (at $J_L = J_M$)
		Torque Control Tolerance (Repeatability)		±2%
		Soft Start Time Setting		0 to 10 sec (Can be set individually for acceleration and deceleration)
	Input Signals	Speed Reference Input	Reference Voltage***	±6V_{DC} (Variable setting range: ±2 to ±10V_{DC}) at rated torque (positive torque reference with positive reference), input voltage: ±12V (maximum)
			Input Impedance	About 14kΩ
			Circuit Time Constant	—
		Torque Reference Input	Reference Voltage***	±3V_{DC} (Variable setting range: ±1 to ±10V_{DC}) at rated torque (positive torque reference with positive reference), input voltage: ±12V (maximum)
			Input Impedance	About 14kΩ
			Circuit Time Constant	About 47μs
		Contact Speed Reference	Rotation Direction Selection	With P control signal
			Speed Selection	With forward/reverse current limit signal (speed 1 to 3 selection), servomotor stops or another control method is used when both are OFF
Position Control Mode	Performance	Bias Setting		0 to 450 rpm (setting resolution 1rpm)
		Feed Forward Compensation		0 to 100% (setting resolution: 1%)
		Positioning Completed Width Setting		0 to 250 reference units (setting resolution: 1rpm)
	Input Signals	Reference Pulse	Type	Sign + pulse train, 90° phase difference 2-phase pulse (A phase + B phase), or CCW + CW pulse train
			Form	Line Driver (+5V level), open collector (+5V or +12V level)
			Frequency	500/200 kpps maximum (line driver/open collector)
		Control Signal		Clear Signal (input pulse form identical to reference pulse)
		Built-in Open-Collector Power Supply****		12V (1kΩ built-in resistor)

Ratings and Specifications (cont'd)

FSP-05~50				
I/O Signals	Position Output	Output Form	A -, B -, C - phase line driver S - phase line driver (only with an absolute encoder)	
		Frequency Dividing Ratio	Any	
	Signal allocation can be modified		Servo ON, P control (or Control Mode switching, forward/reverse motor rotation by internal speed setting, zero clamping, reference pulse prohibited), forward run prohibited (P-OT), reverse run prohibited (N-OT), alarm reset, forward current limit, and reverse current limit (or internal speed selection)	
	Sequence Output	Fixed Output	Servo alarm, 3-bit alarm codes.	
		Signal allocation can be modified	Positioning completed (speed coincidence), during servomotor rotation, servo ready, during current limiting, during speed limiting, brake released, warning, selecting three of the NEAR signals.	
Internal Functions	Dynamic Brake		Operated at main power OFF, servo alarm, servo OFF, or overtravel.	
	Regeneration		External regenerative resistor.	Built-in.
	Overtravel Stop		Dynamic brake stops at P-OT or N-OT, deceleration to a stop, or free run to a stop.	
	Electronic Gear		$0.01 \leq A/B \leq 100$	
	Protection		Overcurrent, overload, regenerative error, main circuit voltage error, heat sink overheat, power open phase, overflow, overspeed, encoder error, encoder disconnected, overrun, CPU error, parameter error.	
	LED Display		Charge, Power, five 7-segment LEDs (built-in digital operator functions)	
	CN5 Analog Monitoring		Built-in analog monitor connector to observe speed, torque and other reference signals. Speed: 1V/1000rpm Torque: 1V/rated torque Pulses remaining: 0.05V/reference unit or 0.05V/100 reference units	
	Communications	Connected Devices	RS-422A port such as for a personal computer (RS-232C ports under certain conditions)	
		1:N Communications	Up to N = 14 for RS-422A ports	
		Axis Address Setting	Set with parameters.	
		Functions	Status display, parameter setting, monitor display, alarm trace-back display, JOG and auto-tuning operations, speed/torque reference signal, and other graphing functions	
		Others	Reverse rotation connection, home position search, automatic servomotor ID, DC reactor connection terminal for high power supply frequency control	

Notes: * Use the servo amplifier within the ambient temperature range. When enclosed, the temperatures inside the cabinet must not exceed the specified range.

** Speed regulation is defined as follows:

$$\text{Speed regulation} = \frac{(\text{no-load motor speed} - \text{full-load motor speed})}{\text{rated motor speed}} \times 100\%$$

*** Forward is clockwise viewed from the non-load side of the servomotor, (counterclockwise viewed from the load and shaft end).

****The built-in open collector power supply is not electrically isolated from the control circuit in the servo amplifier.

Programmable Mode Specifications

The FSP-series is equipped with four control modes, Torque, Speed, Position, and Programmable. For details on the Torque, Speed, and Position modes, see the FSP User's Manual.

Programmable Mode Functions

In this mode the FSP Amp controls sequence and motion profiles. Sequence timing can be controlled by a host through digital I/O.

Configurable Single Axis Control Functions	
Units	Position, speed, acceleration units
Default Motion Profile	Speed, accel, jerk smoothing time
Quick Stop	Quick stop deceleration
Torque Slope	Rate of change of commanded torque
In Position Window	Motion end window (Pn2C0)

Functions programmable in user program or set by serial communication commands in programmable mode	
Inputs	The 7 sequence inputs are programmable in this mode (unless configured for an embedded function)
Outputs	The 3 sequence outputs are programmable in this mode (unless configured for an embedded function)
Homing	Homing to external switch, encoder index pulse, external switch and encoder index pulse, home to a hard stop, and set motor position to zero
PTP Motion	Point to point motion based on programmable motion profile
Electronic Gear	Motion synchronized to master encoder by electronic gear ratio
Phase Shift to Electronic Gear	Motion superimposed on gear ratio using programmable motion profile
Position Latch	High speed latch of motor encoder and master encoder with programmable registration distance (62.5 microseconds)
Registration	Programmable registration distance from latched motor encoder position
Electronic CAM	Motion synchronized to master encoder or virtual axis by electronic cam profile
Torque Mode	Motor torque set by analog input or program command (125 microsecond torque loop update)
Speed Mode	Motor speed set by analog input, pulse reference input, or program command with and without position loop closed (infinite jog)
Multi_Axis Synch	Multiple axes start of motion synchronized by serial or serial communication
Input Synch	Fast input for synchronizing motion to external events (new_move_enable 125 usec)
Output Synch	Fast output for synchronizing external events to motion (fast_output_setting 125 usec)
System Properties	Torque limits and Global Gain Factor (Pn1AO)

Programmable motion profile functions	
Basic PTP motion	Target position, speed, accel, jerk smoothing time
Profile Change On The Fly	Target position, speed, and accel programmable while in motion
Phase Shift	Phase shift position, speed, and acceleration programmable while synchronized to the master by electronic gear
Soft Gear Engagement	Acceleration for synchronizing motion to master encoder by electronic gear ratio
Custom Profiles	Custom profile based on table with ECAM engaged to virtual master

Math Functions	
Integer math operators	*,/,MOD,+,-,AND,XOR,OR

Program Flow	
Basic Program Flow	RUN, END, LABEL, GO_TO, LOOP
Condition Branching	IF, IF_INPUT, INPUT_CASE
Subroutines	CALL, LABEL, RETURN
Interupts	8 user prioritized Interrupts based on external events or logical conditions (EXT_INT, INT, INT_RETURN)
Timing	DELAY, WAIT_EXACT, WAIT_FOR_START, WAIT_INPUT, WAIT_STOP, WAIT_VAR
Auto-Run	Run program at power up at specified label (Pn2CC)
Fault Management	ALARM_RESET, FAULT_MANAGER, FAULT_MANAGER_RETURN, FAULT_MESSAGE_CLEAR

ECAM	
Profiles	4 ECAM profiles per project
Master	ECAM to master encoder or virtual master
Cyclic	Cyclic or Non-Cyclic synchronization
Segments	16 segments per profile
Resolution	Configurable segment resolution, up to 256 table points with table interpolation
Interpolation	Straight line, sinusoidal, or table interpolation between segments
Design	FlexWorks ECAM Editor or import point table from CSV file
Synchronization	Engage and disengage cam based on logical condition or external event
scaling	Master and motor ECAM profile scaling (profile x B/A)
shifting	Master and motor ECAM profile shifting with ECAM engaged (profile +/- C)

Variables	
User Variables	10 variables, each 32 bits
Arrays	Read and Write to 512 point array
System Variables	See table in chapter 9 of the FlexWorks User's Manual: YEA-SIA-FSP-4
Functionality	Use variables in math, as arguments in commands, and in expressions

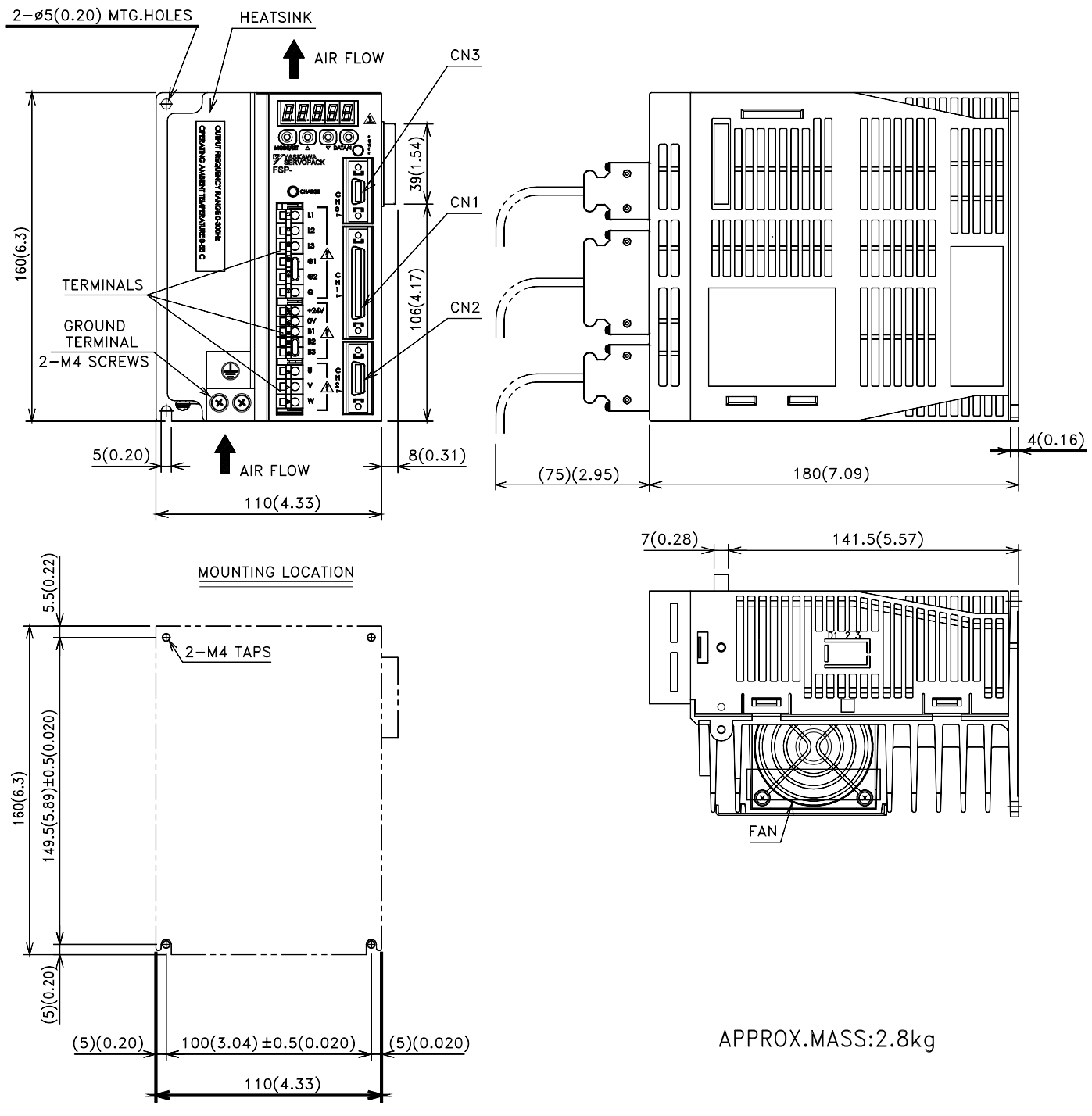
Programming System Properties	
Program line maximum execution time	2 ms
Time between motion commands stored in the Motion Command Buffer	125 usec
Total number of programming lines	100 lines (if ECAM is installed) 180 lines (if ECAM is not installed)

Serial Communication	
Baud Rate	19200 autodetect
Bit Structure	Start - 1 bit, data - 7 bit ASCII code, stop - 1 bit, even number parity - 1 bit, start stop synchronization - 1 bit
Amplifier Address	15 units, 1-F address in hexadecimal
Protocol	N Protocol, see FlexWorks User's Manual: YEA-SIA-FSP-4
Master Message	Broadcast, polling, program, immediate, and sequential mode commands
Functions	Send programming commands, configure ECAM profile, clear program or sequential buffer, read or write to the array, read and write parameters, read system variables, read version number, poll for amplifier status, read or write user variables
Checksum	Enabled or disabled by Pn2C6

Dimensions in inches (mm)

FSP Servo Amplifier

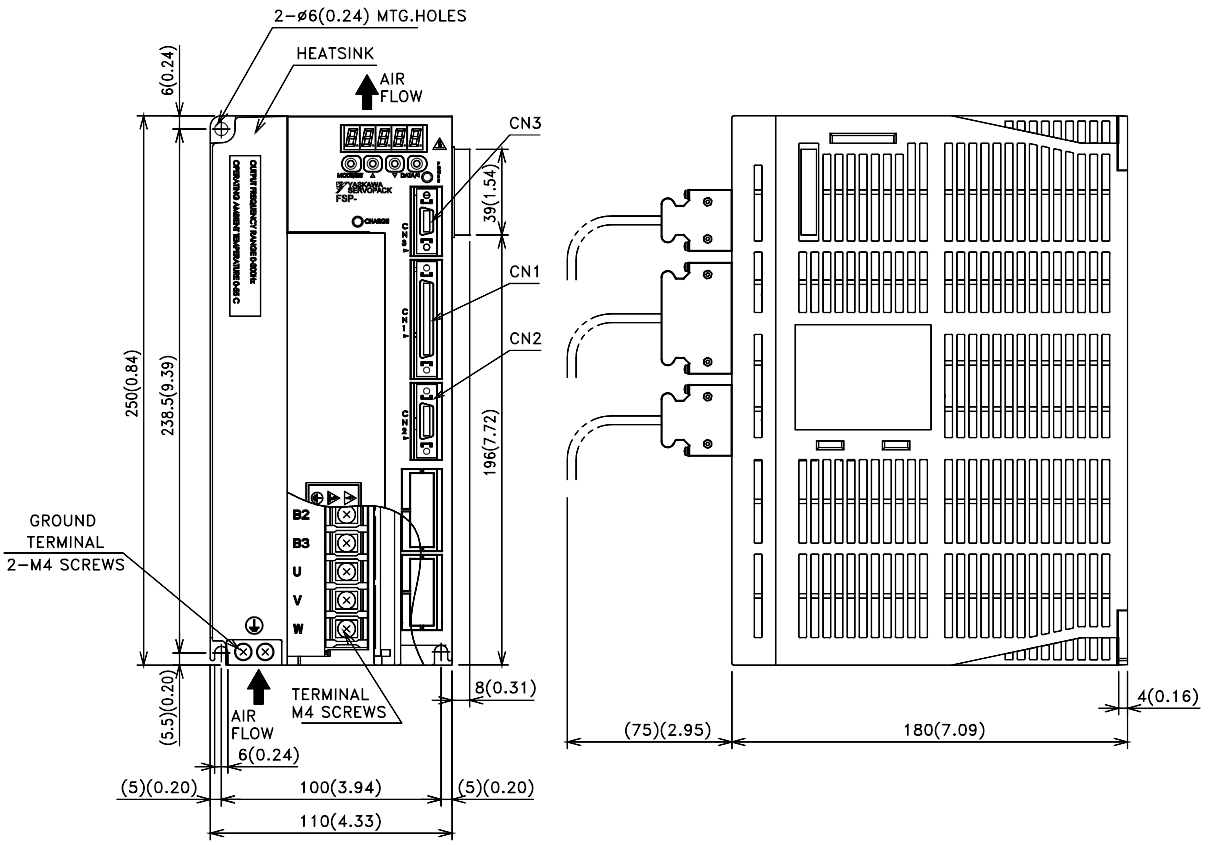
- **FSP-05D□□, -10D□□, -15D□□ (400V Three-phase, 0.5kW to 1.5kW)**

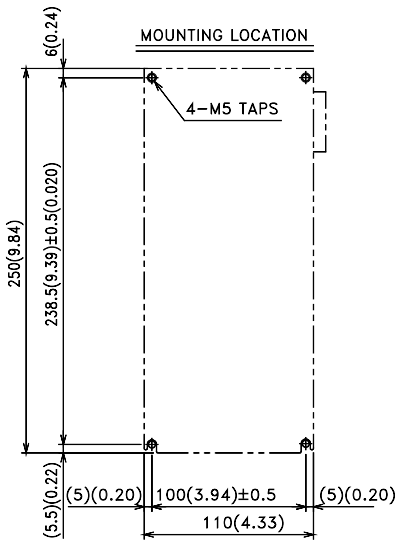


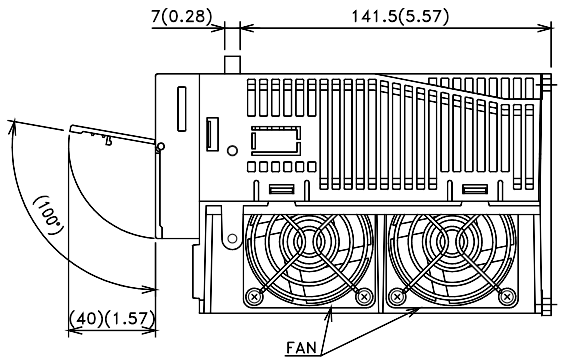
APPROX.MASS:2.8kg

FSP Servo Amplifiers

- **FSP-20□□, 30□□ (400V Three-phase, 2.0kW, 3.0kW)**

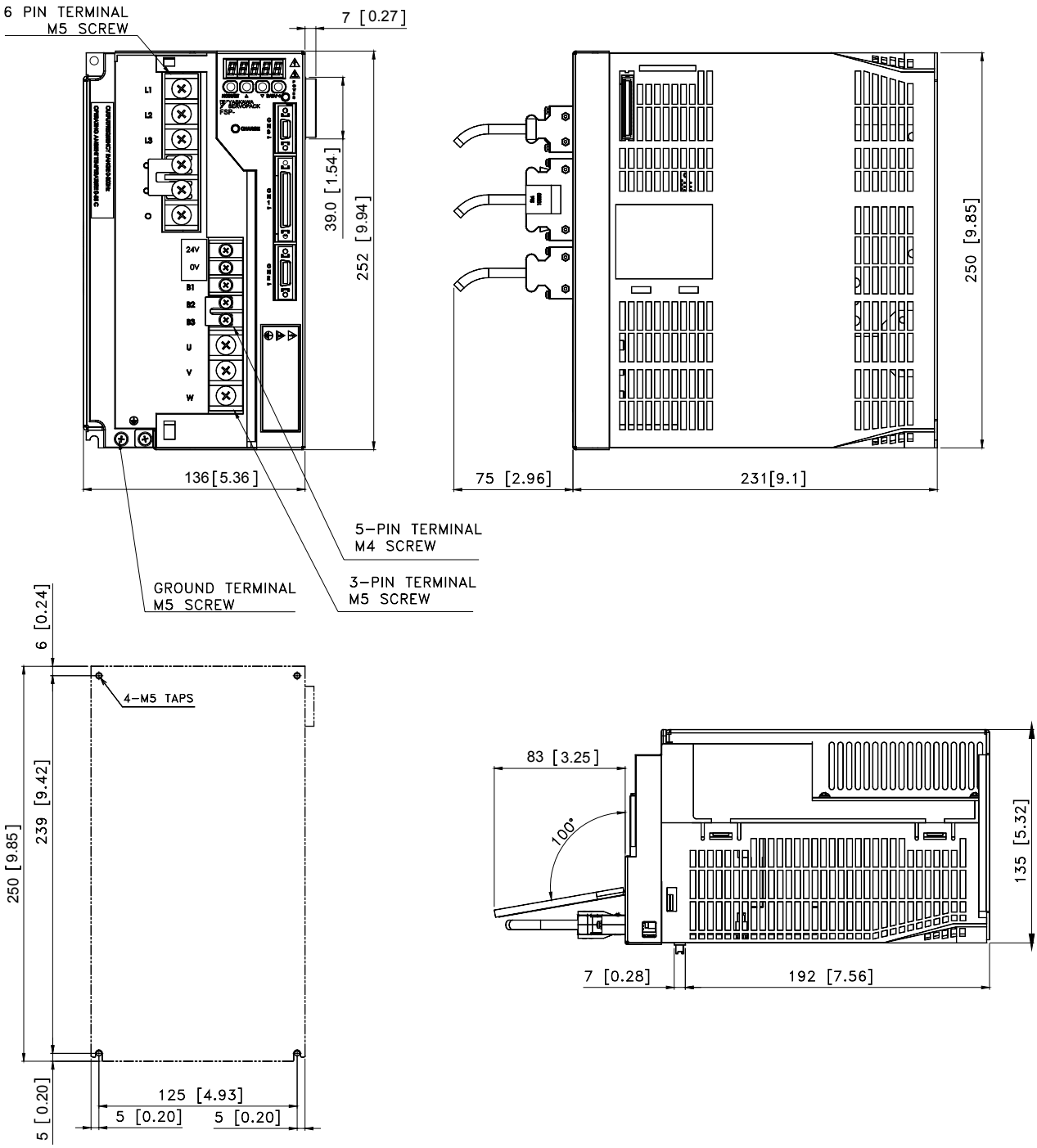






APPROX.MASS:3.8kg

- **FSP-50D□□ (400V Three-phase, 5.0kW)**

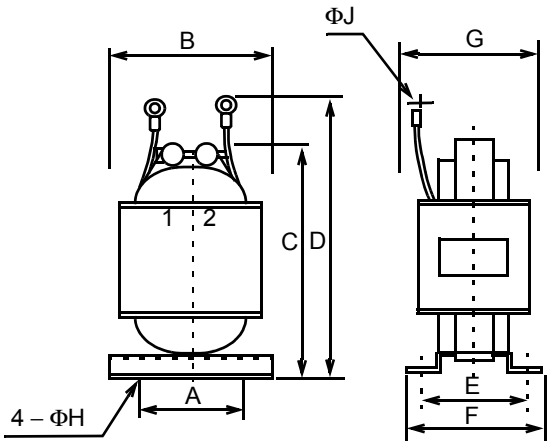


Control of Harmonic Frequency in the Power Supply Circuit

If harmonic frequency control is needed in the power supply, connect a DC reactor between terminals (+) 1 and (+) 2 on the servo amplifier's main circuit. Use the following table as a guide for selection of the appropriate reactor.

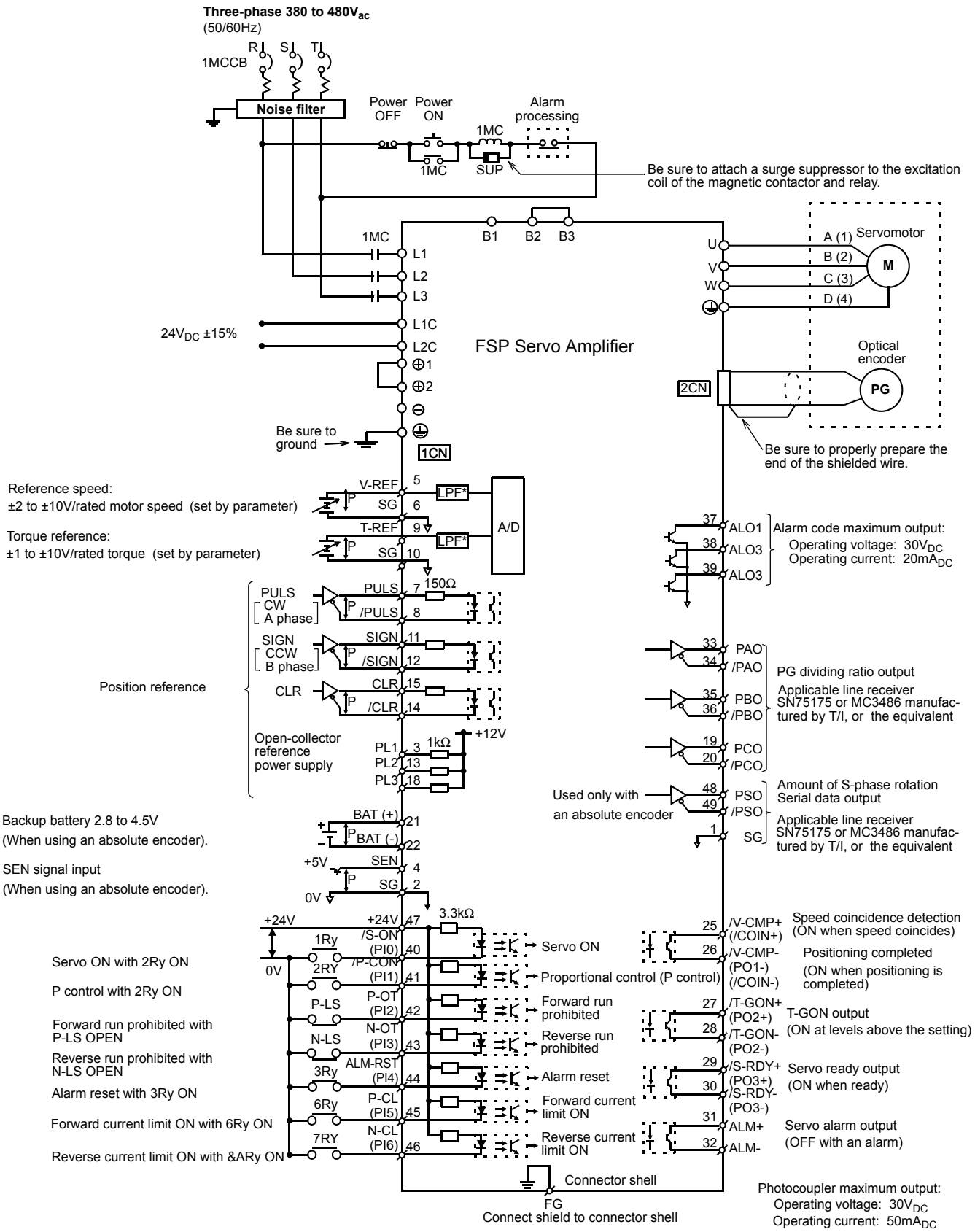
Applicable Servo Amplifier		Reactor Specifications		Reactor Model
		Impedance (mH)	Rated Current (A)	
400V	FSP-05DMC	4.7	1.5	X5074
	FSP-10DMC	3.3	4.5	X5075
	FSP-15DMC			
	FSP-20DMC	2.2	8.6	X5076
	FSP-30DMC			
	FSP-50DMC	1.5	14.1	X5077

- **DC Reactor Dimensional Drawings**



Reactor Model	Dimensions in (mm)									Approximate Mass lb (kg)
	A	B	C	D	E	F	G	ΦH	ΦJ	
X5074	1.18 (30)	1.85 (47)	2.76 (70)	3.35 85	1.10 28	1.50 38	1.77 (45)	0.16 (4)	0.17 (4.3).	0.661 (0.3)
X5075	1.57 (40)	2.32 (59)	3.94 (100)	4.72 (120)	1.57 (40)	1.97 (50)	2.17 (55)			1.984 (0.9)
X5076	1.97 (50)	2.91 (74)	4.92 (125)	5.51 (140)	1.38 (35)	1.77 (45)	2.36 (60)	0.20 (5)		2.43 (1.1)
X5077	Consult factory									

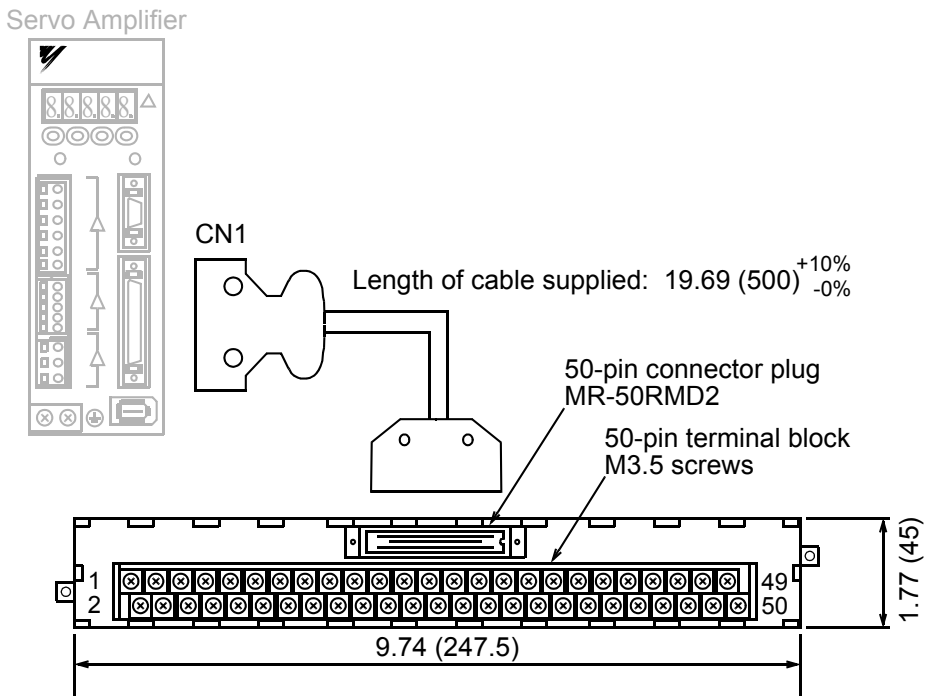
- **400V, 500W to 5kW Models**



*The time constant for the primary filter is 47μs

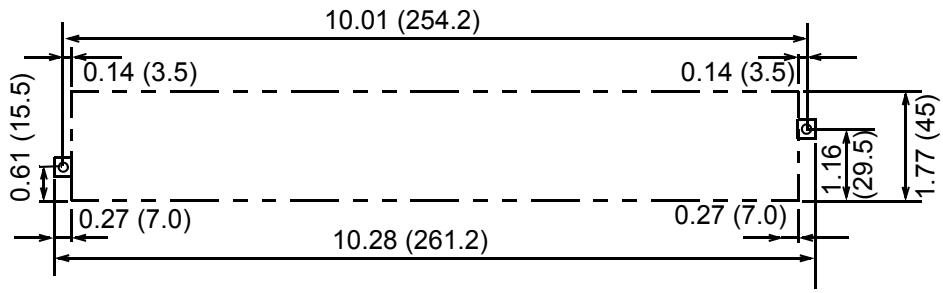
P: Indicates twisted wire pairs.

Connector Terminal Block Converter Unit JUSP-TA50P



Connector Terminal Block Converter Unit
JUSP-TA50P* (cable included)

Mounting Hole Diagram



*terminal specifications : see the following page

JUSP-TA50P Terminal Block Pin Numbers and Signal Names

FSP Servo Amplifier				JUSP-TA50P Terminal Block Unit		
Signal Name*		CN1 Pin Number		Connector Number		Terminal Block Number
SG		1		A1		1
SG		2	P	B1		2
PL1		3		A2		3
SEN		4		B2		4
V-REF		5	P	A3		5
SG		6		B3		6
PULS		7	P	A4		7
/PULS		8		B4		8
T-REF		9	P	A5		9
SG		10		B5		10
SIGN		11	P	A6		11
/SIGN		12		B6		12
PL2		13		A7		13
/CLR		14	P	B7		14
CLR		15		A8		15
		16		B8		16
		17		A9		17
PL3		18		B9		18
PCO		19	P	A10		19
/PCO		20		B10		20
BAT (+)		21	P	A11		21
BAT (-)		22		B11		22
		23		A12		23
		24		B12		24
/V-CMP+		25	P	A13		25
/V-CMP- (PO1-)		26		B13		26
/TGON+ (PO2+)		27	P	A14		27
/TGON- (PO2-)		28		B14		28
/S-RDY+ (PO3+)		29	P	A15		29
/S-RDY- (PO3-)		30		B15		30
ALM+		31	P	A16		31
ALM-		32		B16		32
PAO		33	P	A17		33
/PAO		34		B17		34
BPO		35	P	A18		35
/PBO		36		B18		36
ALO1		37		A19		37
ALO2		38		B19		38
ALO3		39		A20		39
/S-ON (PI0)		40		B20		40
/P-CON (PI1)		41		A21		41
P-OT (PI2)		42		B21		42
N-OT (PI3)		43		A22		43
/ALM-RST (PI4)		44		B22		44
/P-CL (PI5)		45		A23		45
/N-CL (PI6)		46		B23		46
+24V IN		47		A24		47
PSO		48	P	B24		48
/PSO		49		A25		49
		50		B25		50
Connector Case						

Cable: Supplied with the terminal block

P: Indicates twisted pair wires.

* Preconfigured amplifier inputs and outputs are listed above as they are designated when the unit is shipped from the factory. Use the connection diagrams on the previous pages for more functional details.

Cable Specifications and Peripheral Devices

Ratings and specifications for peripheral devices, as well as cable specifications for servo amplifiers are summarized in the tables below.

⚠ CAUTION

Wiring Precautions

- **Do not bundle or run power and signal lines together in the same duct.**
  Keep power and signal lines at least 11.81” (30cm) apart.
- **Use twisted pair or shielded multi-core twisted pair wires for signal and encoder (PG) feedback lines.**
- **The maximum lengths for signal lines are as follows:**
  - Maximum of 9.84ft (300cm) for reference input lines.
  - Maximum of 65.6ft (20m) for PG feedback lines.

Cable Specifications

The following table provides wire size specifications:

External Terminal Name		FSP Terminal Symbol	Wire Size AWG [in^2 (mm^2)]					
			05D□□	10D□□	15D□□	20D□□	30D□□	50D□□
for 400V	Main circuit power input terminals	L1, L2, L3 (Three-phase)	16 AWG [HIV 0.0019 (1.25)]			14 AWG [0.003 (2.0)]		HIV 3.5 (0.005)
	Servomotor connection terminals	U, V, W						
	Control power supply terminals	L1C, L2C	16 AWG [HIV 0.0019 (1.25)]					
	Control I\O signal connector	CN1	Twisted pair or shielded twisted pair wires Core wire at least 28 AWG [0.0002 (0.12)], tinned, annealed copper twisted wires. See page 157 for details. Finished cable dimensions: maximum Φ0.63in (16mm) for CN1 and Φ0.27in (6.8mm) for CN2.					
	PG signal connector	CN2						
	Ground terminal	⏚	14 AWG [HIV 0.003 (2.0)]					

Notes: 1. Wire sizes were selected for three cables per bundle at 40°C ambient temperature with the rated current.
2. Use cables with a minimum withstand voltage of 600V for main circuits.
3. If cables are bundled in PVC or metal ducts, consider the reduction ratio of the allowable current.
4. Use heat-resistant cable under high ambient or panel temperatures where normal vinyl cable will rapidly deteriorate.

The following table shows types of cables. It is used in conjunction with the preceding tables.

Cable Type		Temperature Rating of Conductor °C
Name	Composition	
PVC	Standard polyvinyl chloride cable	-
IV	600V PVC cable	60
HIV	Temperature-resistant vinyl cable	75

The following table specifies the cables for CN1 and CN2 servo amplifier connectors.

Wire sizes were selected with the expectation of three cables per bundle, at an ambient temperature of 40°C, at the rated current level.

Connector Name	Signal	Description	Specification
Control I/O Signal Connector	CN1	Cable	Use twisted pair or shielded twisted pair wire.
		Applicable wire	(AWG): 24, 26, 28
		Finished cable Dimension	Φ0.63 (Φ16.0) maximum
PG Signal Connector	CN2	Cable	Use encoder cable manufactured by Yaskawa when interfacing with Yaskawa motors.

Peripheral Device Types and Capacities

Main Circuit Power Supply	Amplifier Model		Control Power Required (W)	Power Supply				Recommended Noise Filter**		Motor Magnetic Contactor
	Capacity (kW)	FSP-		Capacity per Servo Amplifier (kVA)	Rated Input (A_{rms})	Maximum Inrush Current (A_{rms})	MCCB or Fuse Capacity* (A_{rms})	Model	Specifications	
Three-phase 400V	0.45	05DMC	15	1.2	2.0	28	1.7	Fn258L-7/07 (or FS5826-6-07)	Three-phase $480V_{ac}$ 7A (6A)	10A or equivalent
	1.0	10DMC		2.3	3.5		3.4			
	1.5	15DMC		3.2	4.8		4.6			
	2.0	20DMC		4.9	6.0	56	7.1	Fn258L-16/07 (or FS5826-10-07)	Three-phase $480V_{ac}$ 16A (10A)	20A or equivalent
	3.0	30DMC		6.8	8.5		9.8			
	5.0	50DMC		10.3	14.9	58	14.9	FS5559-35/33 (or FS5827-30-07)	Three-phase $480V_{ac}$ 35A (30A)	40A or equivalent

* Size per local code requirements . Typical fuse interrupting characteristics at 25°C: 200% for 2s minimum; 700% for 0.01s minimum.
** The Fn□□□□ noise filter is manufactured by Schaffner Corporation. Specifications are available at: www.schaffner.com

Peripheral Device Manufacturers

J.S.T. Corporation
1957 South Lakeside Drive
Waukegan, Illinois 60085

Phone: (847) 473-1957
http://www.jst.com

Schaffner EMC Inc.
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Edison, New Jersey 08837

Phone: 1-800 367-5566
(732) 225-9533
Fax: (732) 225-4789
http://www.shaffner.com

TDK Corporation of America
1600 Feehanville Dr.
Mount Prospect, Illinois 60056

Phone: (847) 803-6100
Fax: (847) 803-6296

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